The Navy's Test, Measurement, and Diagnostic Equipment Catalog

2001

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Additional information on the Navy Test, Measurement, and Diagnostic Program and new equipment contracts can be found at the Navy Test Equipment
Web Site: **http://gpete-www.itd.nrl.navy.mil**.

FFT Spectrum Analyzer

SR760

NSN: 7Z6625-01-354-2925

Manufacturer:	Stanford Research Systems
Contract No.:	N00104-97-D-X201
SCAT:	4333
Expiration Date:	4/3/02
Price:	$4,543

Product Features

The SR760 is a single channel, 100 kHz FFT Spectrum Analyzer with a dynamic range of 90 dB and a real-time bandwidth of 100 kHz. The instrument's speed and dynamic range, coupled with it's flexibility and analysis modes including acoustics, vibration, noise measurement, and general electronic use, make it extremely versatile.

Key Specifications and Characteristics

FREQUENCY

Measurement Range:	476 μHz to 100 kHz, baseband and zoomed
Spans:	191 mHz to 100 kHz in a binary sequence
Center Frequency:	Anywhere within the 0 to 100 kHz measurement range
Accuracy:	25 ppm from 20°C to 40°C
Resolution:	Span/400
Window Functions:	Blackman-Harris, Hanning, Flattop and Uniform
Real-time Bandwidth:	100 kHz

SIGNAL INPUT

Number of Channels:	1
Input:	Single-ended or true differential
Input Impedance:	1 MΩ, 15 pf
Coupling:	ac or dc

AMPLITUDE

Full Scale Input:	-60 dBV (1.0 mVpk) to +34 dBV (50 Vpk) in 2 dB steps
Dynamic Range:	90 dB typical
Harmonic Distortion:	No greater than -90dB from dc to 50 kHz (input range ≤0 dBV) No greater than -80dB to 100 kHz
Spurious:	Input range ≥ -50 dBV: No greater than -85 dB below full scale below 200 Hz. No greater than -90 dB below full scale to 100 kHz
Input Sampling:	16-bit A/D at 256 kHz
Accuracy:	±0.2 dB ± 0.003% of full scale (excluding windowing effects)

TRIGGER INPUT

Modes:	Continuous, internal, external, or TTL
Internal Level:	Adjustable to ±100% of input scale Positive or negative slope
Minimum Trigger Amplitude:	10% of input range
External Level:	±5V in 40 mV steps Positive or negative slope 10 kΩ Impedance

DISPLAY FUNCTIONS

Display:	Real, Imaginary, Magnitude or Phase Spectrum

Manufacturer:	Dranetz Technology
Contract No.:	N00104-99-D-X003
SCAT:	4243
Expiration Date:	12/23/03
Price:	$7,738

Three Phase Power Analyzer
4300
NSN: 7Z6625-01-461-4467

Product Features

The Dranetz Model 4300 is a three-phase volt-amp-power-harmonic meter with 1 second updates of voltage, amperes, watts, VA, VAR, power factor, frequency, voltage unbalance, V&I total harmonic distortion, current crest factor, K factor, demand, energy, and harmonics. The unit provides real time viewing of voltage and current waveforms. The handheld model 4300 meets a wide range of applications.

Key Specifications and Characteristics

VOLTAGE MEASUREMENTS
4 Fully differential channels
10-600 Vrms; user selected 0.5-20Vrms on one channel
Accuracy: ±1% reading ±0.05% full scale

VOLTAGE TRANSIENTS
50-1000 Vpk; user selected 1-30Vpk on one channel
1 microsecond minimum duration
Accuracy: ±10% reading ±1% full scale

CURRENT MEASUREMENTS
4 Fully independent current channels
10-200% of full-scale current probe rating
Accuracy: ±1% reading ±0.05% full scale
(at fundamental, plus current probe accuracy)

CURRENT TRANSIENTS
10-300% CT full scale except Chan D 2-200%
CT full scale
1 microsecond minimum duration
Accuracy: ±10% reading ±1% full scale plus probe

FREQUENCY
Fundamental range 30-450 Hz
Accuracy: ±0.2% of reading

UPDATE RATES
All parameters updated once per second
(Harmonic-based parameters updated every 5 seconds)

ENVIRONMENT
40F TO 113F, +5C TO +45C,
HUMIDITY 10% - 90% non-condensing

BATTERY
2 hours operation, 3 hours full recharge
(continuous operation from battery eliminator)

Manufacturer:	Boonton Electronics
Contract No.:	N00104-98-D-X115
SCAT:	4344
Expiration Date:	9/21/03
Price:	$5,201

AUDIO ANALYZER
1121

NSN: 7Z6625-01-458-5918

Product Features

The Model 1121 Audio Analyzer is a low distortion audio source used for testing systems, amplifiers, receivers, and components. It covers 10Hz to 200 kHz and incorporates selectable output impedances of 50, 150 and 600 ohms; 16volt rms output; additional 0.3-millivolt full scale measurement range, and quasi-peek detection. The 1121 can be used as a direct replacement in present 1120 applications. The instrument automatically tunes and autoranges for maximum accuracy and resolution. Distortion, frequency response, AC and DC voltage measurements are a single keystroke away. With a built in low distortion audio source, the instrument is ideally suited for stimulus response applications.

Key Specifications and Characteristics

FREQUENCY MEASUREMENT

Range: 5 Hz to 200 kHz

Resolution:
0.001 Hz; 5.000 Hz to 199.999 Hz
0.01 Hz; 200.00 Hz to 1999.99 Hz
0.1 Hz; 2.0000 kHz to 19.9999 kHz
1.0 Hz; 20.000 kHz to 199.999 kHz

Accuracy: Timebase accuracy +1 count

Sensitivity: 5.0 mV in the Frequency mode
50.0 mV in the Distortion and SINAD modes

Timebase
Type: 10 MHz TCXO

Accuracy: ±1 ppm yr

AC LEVEL MEASUREMENT RANGES

300.0 V, 30.00 V, 3.000V, 300.0 mV, 30.00 mV, 3.000 mV and 0.300 mV (full scale)

DC LEVEL MEASUREMENT RANGES

300.0 V, 30.00 V, 3.000V (full scales)

Distortion Measurement Fundamental Frequency Range: 10 Hz to 100 kHz usable to 140 kHz

Display Range: 0.00 to 140.00 dB

Accuracy: ±1 dB; 20 Hz to 20 kHz
±2 dB; 10 Hz to 100 kHz

Input Voltage Range: 50 mV to 300 V

Signal to Noise Measurement Frequency Range:
10 Hz to 100 kHz usable to 140 kHz

Display Range: 0.00 to 140.00 dB

Accuracy: ± 1 dB

Input Voltage Range: 50 mV to 300 V

Common Mode Rejection Ratio CMRR:
>70 dB; 20 Hz to 1 kHz Vin < 3 V
> 45 dB; 1 kHz to 20 kHz, Vin <3V

Power Requirements: 80 VA; 100, 200, 120, 220 or 240V, 50 to 400 Hz

Operating Temperature: 0Eto 55EC

Vector Network Analyzer
8722ES-E92

NSN: 7Z6625-01-462-7494

Manufacturer:	Agilent Technologies
Contract No.:	N00104-99-D-X004
SCAT:	4212
Expiration Date:	2/10/04
Price:	$62,905

Product Features

The Agilent Technologies 8722ES vector network analyzer characterizes RF and microwave components down to 50 MHz and up to 40 GHz. This analyzer includes a fast-sweeping synthesized source, S-parameter test set, tuned receiver, and large color display in a single package. The 8722ES is an ideal choice for cost and pace conscious engineers in research and development, manufacturing, incoming inspection, or quality assurance. High source power and high receiver sensitivity combine to give the 8722ES 100dB of dynamic range. The serial and parallel interfaces support printers and plotters, and the built-in 3.5" floppy disk drive supports both DOS and LIF formats.

Key features are:

- Fast sweep speed, error correction, register recall, and data transfer.
- Integrated switching test set measures all four S-parameters with a single connection.
- Two independent display channels for simultaneous measurement of reflection and transmission characteristics.
- Simultaneously displays all four S-parameters while tuning devices.
- Optional time domain capability computes and displays response versus time or distance.

Key Specifications and Characteristics

SOURCE

Minimum Frequency:	50 MHz
Maximum Frequency:	40 GHz
Resolution:	1 Hz
Frequency Accuracy:	10 ppm

OUTPUT

Maximum Power:	-10 dBm
Minimum Power:	-75 dBm
Power Resolution:	0.01 dB
Power Flatness:	±3 dB
Power Sweep Range:	15 dB

RECEIVER

Receiver Sensitivity:	>2 GHz: -92 dBm
System Dynamic Range:	> 2 GHz: 82 dB
Test Port Connector:	2.4 mm

TYPICAL MEASUREMENT RATE

1-Port Cal, Narrow Band Sweep:	93 ms
2-Port Cal, Narrow Band Sweep:	173 ms
1-Port Cal, Full Span Sweep:	696 ms
2-Port Cal, Full Span Sweep:	1376 ms

Manufacturer:	Agilent Technologies
Contract No.:	N00104-99-D-X010
SCAT:	4338
Expiration Date:	6/17/04
Price:	$13,534

Microwave Spectrum Analyzer

E4407S-E57

NSN: 7Z6625-01-465-1844

Product Features

The Agilent Technologies E4407S-E57, general-purpose, portable spectrum analyzers offer engineers in R&D, manufacturing and field service faster measurement speed than comparably priced products. Engineers will also find that the superior dynamic range, accuracy and resolving power surpass other similarly priced analyzers.

Key Specifications and Characteristics

FREQUENCY RANGE

Frequency Range: 9 kHz to 40 GHz
Frequency Accuracy(at 1 GHz, 25 °C) ±111 Hz
Span Accuracy: ±1%
Noise Sidebands(at >=10 kHz offset) <=-90 dBc/Hz
Residual FM: <=2 Hz peak to peak in 100 ms
Resolution Bandwidth Range 10 Hz to 3 MHz, in 1-3-10 Sequence, 200 Hz, 9 kHz, 120 kHz and 5 MHz

AMPLITUDE SPECIFICATIONS

Measurement Range: -150 dBm to +30 dBm
Maximum Sensitivity: -150 dBm
Gain Compresssion: 0 dBm
Attenuator Range: 0 to 65 dB in 5 dB steps
Maximum Dynamic Range (2nd/3rd order) >=90 dB/97 dB1 >=101 dB, typical third order 20 °C to 30 °C
SHI (Second Harmonic Intercept) +45 dBm
TOI (Third Order Intercept) +11 dBm +16 dBm, typical 20 °C to 30 °C

Calibrated Display Range: 85 dB/120 dB
Overall Accuracy (20 °C to 30 °C, 0 to -50 dBm, 1 kHz RBW) 9 kHz to 3 GHz: ±1.0 dB
3 GHz to 6.7 GHz: ±2.0 dB
6.7 GHz to 40 GHz: ±2.5 dB

SPEED SPECIFICATION

Minimum Sweep Time (3 GHz span RF) 5 ms
Minimum Zero Span Sweep Time 20 µs
Remote Measurement and HP-IB Trace Transfer Rate (auto align off, 5 ms sweep time, fixed center frequency, display off) ≥19/sec, characteristic
Local Measurement and Display Update Rate (auto align off, 5 ms sweep time, fixed center frequency) ≥28/sec, characteristic
Warm-up Time: 5 minutes

Manufacturer:	Anritsu
Contract No.:	N00104-00-D-X104
SCAT:	4341
Expiration Date:	5/16/05
Price:	$11,074

Spectrum Analyzer

MS2661N

NSN: 7Z6625-01-474-6317

Product Features

The MS2661C Portable Spectrum Analyzer is for signal analysis of radio and other equipment related to improving frequency usage efficiency, higher modulation, and digitalization. This is a synthesized spectrum analyzer covering a wide frequency range from 9 kHz to 3 GHz. It has superior basic performance such as high C/N ratio, low distortion, and high frequency/level
accuracies and is easy to operate. It has a "Measure" function for evaluation of radio equipment (frequency counter, C/N, adjacent channel power, occupied frequency bandwidth, burst average power, and template decision function), and which enables the two-screen display and FMdemodulation waveform display.

Key Specifications and Characteristics

FREQUENCY

Range: 9 kHz to 3 GHz
Frequency Counter: Resolution: 1Hz, 10 Hz, 100 Hz, 1 kHz
Frequency Span: Setting Range: 0 Hz, 1 kHz, 3.1 GHz
Accuracy: ±2.5% (span:≥ 10 kHz)
Resolution (RBW, 3 dB bandwidth): Setting Rang:
1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz,
1 MHz, 3 MHz (manually settable, or automatically
settable according to frequency span)
Reference oscillator: Freq: 10 MHz

AMPLITUDE

Measurement Range: Average noise level to +30 dBm
Average Noise Level: £-115 dBm (1MHz to 1 GHz),
≤-115 dBm + f [GHz} dB (> 1 GHz)

SWEEP (FREQUENCY DOMAIN)

Sweep Time: 20 ms to 1000 s
Zone Sweep: Sweep in zone markers

SWEEP (TIME DOMAIN)

Sweep Range: Analog zero span. Digital zero span

ZONE SWEEP

Sweeps only in frequency range indicated by zone marker

TRACKING SWEEP

Sweeps while tracing peak points within zone marker

Sweep Signal Generator
68369NV

NSN: 7Z6625-01-425-2550

Manufacturer:	Anritsu
Contract No.:	N00104-96-D-N010
SCAT:	4380
Expiration Date:	3/4/01
Price:	$17,732

Product Features

The 68369NV Sweep Signal Generator provides high performance and economy in full function microwave synthesized signal generators. High output and low spurious outputs make the 68369NV ideal for local oscillator duty. Simultaneous internal AM, FM, pulse, frequency sweep, and power sweep functions provide the signal generation power for signal simulation. Three separate frequency sweep–modes, analog, step, and manual–and step power sweep satisfy network analysis requirements.

Key Specifications and Characteristics

FREQUENCY
Range: 10 MHz to 40 GHz

CW MODE
Accuracy: Same as internal time base
Int. Time Base: <2 x 10^{-8}/day
Temperature: <2 x 10^{-8}/°C (0 to 55°C)
Resolution: 0.1 Hz
Switching Time: <40 ms to be within 1 kHz of setting

ANALOG SWEEP MODE
Sweep Width: Independently selected from 1 MHz to full range continuous sweep
Sweep Time: 30 ms to 99 s
Accuracy: The lesser of ±30 MHz or (±2 MHz + 0.25% of sweep width) for sweep speeds of ≤50 MHz/ms

PHASE-LOCKED STEP SWEEP MODE
Sweep Width: 0.1 Hz to full range
Resolution: 0.1 Hz (minimum step size)
Accuracy: Same as internal time base
Number of Steps: Variable from 1 to 10,000
Plot alternate and manual sweep

SPECTURAL PURITY
Spurious Signals:
- 10 MHz to 50 MHz: ≤30 dBc
- 50 MHz to 2 GHz: ≤40 dBc
- 2 GHz to 20 GHz: ≤60 dBc
- 20 GHz to 40 GHz: ≤40 dBc

Single-Sideband Phase Noise @ 10 kHz Offset From Carrier
- 600 MHz: -86 dBc/Hz
- 2 GHz: -86 dBc/Hz
- 20 GHz: -78 dBc/Hz
- 40 GHz: -72 dBc/Hz

AM Noise Floor: -145 dBm/Hz @ 0 dBm output

OUTPUT POWER
Continuously variable from maximum power out to -120 dBm (typical) in 0.01/dB setting.
Maximum Leveled Output Power:
- 0.01 to 2 GHz: +11.0 dBm
- 2 to 20 GHz: +7.0 dBm
- 20 to 40 GHz: +3.0 dBm

MODULATION
Two Internal Independant Sources
Sinusoidal Frequency Range: 0.1 Hz to 1 MHz
Resolution: 0.1 Hz
Wave Forms: Sine, square wave, triangle positive ramp, negative ramp, noise
Internal/External AM: 0 to 50 kHz
Internal/External FM: 1 kHz to 10 MHz
External Pulse Modulation: >80 dB on/off ratio
Internal Pulse Modulation: Free running, triggered, gated, delayed, singlet, doublet, triplet, quadruplet

Manufacturer:	Anritsu
Contract No.:	N00104-97-D-X202
SCAT:	4370
Expiration Date:	4/28/02
Price:	$7,111

Signal Generator
MG3641N

NSN: 7Z6625-01-443-0552

Product Features

The MG3641N is a synthesized signal generator with excellent spurious and leakage characteristics. The generator can be used to test communication systems operating with a variety of modulation methods. The carrier frequency is produced by a high stability crystal oscillator and remains phase locked.

Key Specifications and Characteristics

CARRIER FREQUENCY

Range:	125 kHz to 1040 MHz
Resolution:	0.01 Hz
Accuracy:	same as reference frequency
Int. Ref. Osc.:	Frequency: 10 MHz Aging: $\pm 2 \times 10^{-8}$/day
Ext. Ref. Input:	5/10 MHz

OUTPUT LEVEL

Range:	-143 to +17 dBm
Unit:	dBm, dBmV, mV, µV
Resolution:	0.01 dm
Frequency Response:	Flatness ±0.5 dB relative to 0 dBm
Accuracy:	±1dB (≤ +17 dBm, ≥ 127 dBm) ±3 dB (< -127 dBm), with pulse modulation on ±1 dB ≤ +12 dBm ≥ -127 dBm ±3 dB (< -127 dBm)
Impedance:	50 Ω, type N connector

SIGNAL PURITY

Spurious:	Harmonics: < -30 dBc Nonharmonics: < -100 dBc (> 15 kHz offset)
Powerline:	< -40 dBc (<15 kHz offset)
SSB Phase Noise:	< -130 dBc/Hz (>512 MHz) < -136 dBc/Hz (<512 MHz)
Residual AM:	< -80 dBc
Residual FM:	CW (50 Hz to 15 kHz band) <5 Hz rms (>10 MHz <512 MHz) <10 Hz rms (>512 MHz)

AMPLITUDE MODULATION

Range:	0 to 100%
Resolution:	0.1%
Accuracy:	±(5% of set value +2%)
Distortion:	<-40 dB (AM 30%) <-30 dB (AM 90%)
Incidental FM:	<200 Hz peak

FREQUENCY MODULATION

Deviation/Range:

0 kHz to 1 kHz (>1 MHz, <2 MHz)
0 kHz to 10 kHz (>8 MHz, <16 MHz)
0 kHz to 1024 kHz (>512 MHz)

Modulation Frequency Response: dc or 10 Hz to 20 kHz (>0.4 MHz, <10 MHz)
dc or 10 Hz to 100 kHz (>10 MHz)

PULSE MODULATION

ON/OFF:	>80 dB
Rise Time/Fall Time:	<100 ns
Minimum Pulse Width:	<500 ns
Pulse Repetition:	dc to 1 MHz

MODULATION SIGNAL SOURCE

Internal Modulation: (Int 1,2)	Freq: 0.01 Hz to 400 kHz Sinewave Freq: 0.01 Hz to 50 kHz (triangular, square, sawtooth wave)
External Modulation Optimum Input Level:	Approximately 2 Vp-p

AF OUTPUT

Output Level:	0 V to 4 Vp-p
Output Level Resolution:	1 mVp-p
Impedance:	600 Ω, BNC connector on front panel

SWEEP FUNCTION

Sweep Parameter: Frequency, output level

Manufacturer:	Giga-tronics
Contract No.:	N00104-99-D-X009
SCAT:	4920
Expiration Date:	4/29/04
Price:	$8,483

Power Meter
8501A - 362

NSN: 7Z6625-01-412-6479

Product Features

The 8501A Series Peak Power Meter measures peak power from +20 dBm to -20 dBm and CW power from +20 dBm to -40 dBm. Power readings are displayed on an LCD display using the readout mode.

Pulse profiles can also be displayed, using the display GRAPH mode together with amplitude and timing information for the pulse waveform. Pulse risetime, falltime, and pulse width measurements can be accurately and easily made using built-in markers.

Balanced diode power sensors are used to minimize errors due to phase changes of even order harmonics. The low-input VSWR minimizes mismatch errors to improve accuracy. The diode elements are field replaceable.

Key Specifications and Characteristics

FREQUENCY RANGE
30 MHz to 18 GHz

POWER RANGE
Pulse: -20 dBm to +20 dBm
CW: -40 dBm to +20 dBm

ACCURACY
Calibrator Power Uncertainty: ±1.5% (at 0 dBm)
Linearity After Automatic Calibration: ±3% (at stable temp.)

TIME BASE RANGE
1.2 ns/div to 20 ms/div
(12 ns to 200 ms time window)

TRIGGER DELAY RANGE
0 to 200 ms
Resolution: 0.1 ns
Accuracy: 0.01% of delay, ±1 ns

TRIGGERING MODES
Intemal: -10 dBm to +16 dBm
External (BNC): TTL levels, max PRF 1 MHz

MARKERS
Up to four markers/channel plus a Reference Power Level cursor

GRAPH DISPLAY MODE
Plots the outline of the detected pulse on the LCD display. Also provides readout of amplitude and timing information.

CALIBRATOR
Frequency: 1 GHz ±5%
Power Uncertainty at 1mW: ±1.5%, directly traceable to NIST

Return Loss at 1 mW: >25 dB
Self calibration Time: <1 min
Connector: Type N

GPIB INTERFACE
In accordance with IEEE STD 488-1978

REMOTE OPERATION
Complete setup and measurement capabilities accessible via GPIB (IEEE-488). Reporting of errors, malfunctions, operational status and self-test diagnostics available through serial poll capability.

Noise Figure Meter
8970B-E23
8970B-E29

NSN: 7Z6625-01-311-1704
NSN: 7Z6625-01-311-7549

Manufacturer:	Agilent Technologies
Contract No.:	N00104-98-D-X110
SCAT:	4329/TBD
Expiration Date:	6/24/01
Price:	$18,125 $22,830

Product Features

The Agilent Technologies 8970B-E23 Noise Figure Meter with its 346C noise source provides easy, accurate, and repeatable noise figure measurements at frequencies up to 26.5 GHz.

However, the 8970B-E29 Noise Figure Meter with its 346C and R347B noise sources provide noise figure measurements at frequencies up to 40 GHz. In addition, the wide dynamic range of the 8970B allows simultaneous gain measurements up to 40 dB or loss measurements to 20 dB, with no external attenuation or amplification. Low instrumentation uncertainty (0.1 dB) and automatic second stage correction make accurate noise figure readings possible even for low- gain devices.

Key Specifications and Characteristics

NOISE FIGURE MEASUREMENT

Measurement Range:	0 dB to 30 dB
Uncertainty:	≤0.1 dB
Resolution:	0.01 dB

GAIN MEASUREMENT

Range:	-20 dB to +40 dB
Uncertainty:	0.15 dB
Resolution:	2-9.99 dB Gain: 0.01 dB; Gain ≥9.99 dB: 0.1 dB

INPUT SPECIFICATIONS

Frequency Range:	10 MHz to 1600 MHz
Tune Accuracy (10°C to 40°C):	1 MHz + 1% of frequency; 6 MHz maximum

NOISE SOURCE

Frequency Range:	346C: 10 MHz to 26.5 GHz R347B: 26 GHz to 40GHz

(Please note: Both the 346C & R347B only come with the model 8970B-E29)

Excess Noise Ratio (ENR) Limits:	346C: 12 dB to 16 dB (10 MHz to 12 GHz) and 14 dB to 17 dB (12.0GHz to 26.5 GHz) R347B: 10 dB to 13 dB (26.5 GHz to 40 GHz)
Maximum SWR (Reflection Coefficient) On and Off:	346C: 10 MHz to 18 GHz to 1.25 (0.11); 18 GHz to 26.5 GHz to 1.35 (0.15) R347B: <1.42 (0.17)
Power Required:	28 ±1 Vdc
Size:	21 mm x 140 mm x 30 mm (0.8 in. x 5.5 in. x 1.2 in.)
Weight:	Net, 0.108 kg (3.5 oz); shipping, 0.5 kg (1 lb)
Standard Connector:	APC-3.5 (male)

SUPPLEMENTAL CHARACTERISTICS

Bandwidth:	4 MHz (approximately)
Sensitivity:	-100 dBm
Max Input Level:	<20 Vdc; +20 dBm

Handheld Multimeter

77/BN

NSN: 1H6625-01-336-3372

Manufacturer:	Fluke
Contract No.:	N00104-96-D-N009
SCAT:	4245
Expiration Date:	2/5/01
Price:	$96

Product Features

The 77/BN Handheld Multimeter provides voltage, current, and resistance measurements and includes range hold, which simplifies go no-go and "dipping" measurements. It provides audible tones for continuity measurements and standard semiconductor voltage drop measurements. The Touch Hold feature allows storing the display value even after the test probes are removed from the circuit under test.

Key Specifications and Characteristics

VOLTAGE

DC Volts: 0 V to 1,000 V ±(0.3% + 1 count)
AC Conversion: ac-coupled, average responding, and calibrated to the rms value of a sine wave input
Best Resolution: 0.1 mV in 320 mV range
Input Impedance: 10 MΩ nominal, <50 pF
DC Volts Normal Mode Rejection: >60 dB @ 50 Hz or 60 Hz
DC Volts Common Mode Rejection Ratio: >120 dB @ dc
AC Volts Common Mode Rejection Ratio: >60 dB
Overload Protection:
1000 Vdc (500 V dc, 500 Vac {sine} on mV range), 750 Vac rms (sine)

CURRENT

DC: 0 to 10.00A ±(1.5% + 2 counts) to 20.00A for 30 s max
AC Conversion: Same as voltage
Best Resolution: 0.01mA in 32mA range, 0.01A in 10A range
Burden Voltage: 6 mV/mA for mA input, 50 mV/A for A input
Input Protection: mA to 630mA, 250V FAST fuse A to 15A, 600V FAST fuse

OHMS AND DIODE TEST

Ohms: 32 MΩ range ± (2% +1)
Diode Test: To 2.0 V
Continuity: Continuous tone (4096 Hz) for resistance < 150 Ω
Overload Protection: 500 Vdc or rms (sine)
Open Circuit Voltage: <3.1 Vdc (diode test); <3.1 Vdc (Ω)
Full Scale Voltage (Ω): <440 mVdc to 3.2 MΩ, <1.4 Vdc for 32 MΩ

ENVIRONMENTAL

Operating Temperature: 0°C to 50°C
Storage Temperature: -40°C to 60°C
Temperature Coefficient: 0.1 x (specified accuracy)/°C (<18°C or >28°C)
Relative Humidity: 0% to 90% (0°C to 35°C); 0% to 70% (35°C to 50°C)
Shock, Vibration: Per MIL-T-28800

GENERAL SPECIFICATIONS

Maxaximum Voltage to Earth: 1000 Vdc, 750 Vac rms (sine)
Battery Type: 9 V, NEDA 1604 or 6F22 or 006P
Battery Life: 2000 h typical (alkaline)
Size: 166 mm L x 75 mm W x 28 mm H (6.55 in. L x 2.95 in. W x 1.12 in. H)
Weight: 340g (12 oz) without holster
Automatic Touch Hold: Automatically holds each new reading; beeps when reading is stable; automatically reset between readings
Display: 3200 counts, updates 2.5/s
Analog: 31 segments, update rate 25/s
Voltage

Analog/Digital Multimeter

87-3

NSN: 1H6625-01-312-2930

Manufacturer:	Fluke
Contract No.:	N00104-97-D-N006
SCAT:	4249
Expiration Date:	11/27/01
Price:	$250

Product Features

The 87 Analog/Digital Multimeter provides 11 functions for electronic and industrial applications, including high performance dc/ac voltage and current measurment, frequency, duty cycle, resistance, conductance, and capacitance measurement. The Min/Max/Average mode stores the highest, lowest, and 36-h average of all readings, allowing signal monitoring for seconds or days. Meets UL3111, CSA C22.2 No. 1010, and TUV to EN61010 listing.

Key Specifications and Characteristics

DC VOLTAGE
Range: 400 mV to 1000 V
Accuracy: ±(0.1% + 1)
Resolution: 0.1 mV

AC VOLTAGE
Range: 400 mV to 1000 V
Accuracy: ±(0.7% + 2)
Resolution: 0.1 mV

DC CURRENT
Range: 400mA to 10A
(up to 20 A for <30 s)
Accuracy: ±(0.2% + 2)
Resolution: 0.1mA

AC CURRENT
Range: 400mA to 10A
(up to 20 A for <30 s)
Accuracy: ±(1% + 2)
Resolution: 0.1mA

RESISTANCE
Range: 400 Ω to 40 MΩ
Accuracy: ±(0.2% + 1)
Resolution: 0.1 Ω

CONDUCTANCE
Range: 40 ns
Accuracy: ±(1% + 10)
Resolution: 0.01 ns

CAPACITANCE
Range: 5 nF to 5 mF
Accuracy: ±(1% + 2)
Resolution: 0.01 nF

FREQUENCY
Range: 199.9 Hz to 199.9 kHz
Accuracy: ±(0.005% + 1)
Resolution: 0.01 Hz

DISPLAY
Digital: 4000 counts
(Selectable 19,999 count resolution)
Analog: Pointer

FEATURES
Auto and manual ranging
Min/Max recording
Relative mode
True rms voltage and current
Touch-hold
Rugged, o-ring sealed case
Sealed battery/fuse doors
Min/Max relative mode
Audible continuity/diode test
EMI shielded

Power & Harmonics Meter

41B-AV

NSN: 7Z6625-01-438-5312

Manufacturer:	Fluke.
Contract No.:	N00104-98-D-X113
SCAT:	4247
Expiration Date:	5/17/03
Price:	$966

Product Features

The Fluke 41B can be used to measure active power and power factor for single or 3-phase loads. The liquid crystal display is easy to read and provides accurate voltage/amp/watt measurements.

Key Specifications and Characteristics

RANGE/LEVELS
Range: 6-65 Hz and DC s

Minimum Input Levels: 5V rms or 1A rms

VOLTS MEASUREMENTS (TRUE-RMS)
Input Range: 5.0V to 600V rms (ac + dc),
5.0V to ± 933V peak

Basic Accuracy: rms (ac + dc): ±(0.5% + 2 digits)
peak, dc: ± (2% + 3 digits)

Input Impedance: 1 MW, balanced

AMP MEASUREMENTS (TRU-RMS)
(1 mV/A) Isolated Input

Input Range
0.0mV (A) to 1000 mV rms (A) (ac + dc)
1.0mV (A) to ±2000mV (A) peak

Basic Accuracy
rms (ac + dc): ±(0.5% + 3 digits) + probe specs
peak, dc: ±(2% + 4 digits) + probe specs

Input Impedance
1MΩ || 47 pF

WATTS MEASUREMENTS (VOLT-AMPS)
(1mV/A) Isolated Input

Range: OW (VA) to 600 kW (kVA) average
OW (VA) to 2000 kW (kVA) peak, Accuracy (ac + dc),
Active W (VA): ±(1% = 4 digits) + probe specs

HARMONICS MEASRUEMENT ACCURACY
(Cursor Data)
(Harmonic Level >5% Using Smooth – 20)

Volts
Fundamental to 13th Harmonic:
±(2% + 2 digits)
13th to 31st Harmonic:
13th (±(2% + 2 digits))-
-31st (±(8% + 3 digits) + probe specs)

Amps or Watts
Fundamental to 13th Harmonic:
±(3% + 3 digits) +probe specs
13th to 31st Harmonic:
13th (±3% + 3 digits) + probe specs
-31st (±(8% + 3 digits) + probe specs)

Manufacturer:	QuadTech Inc.
Contract No.:	N00104-98-D-X117
SCAT:	4251
Expiration Date:	9/23/03
Price:	$6,521

LCR Meter
7600
NSN: 7Z6625-01-458-6369

Product Features

The QuadTech Model 7600 provides precision impedance measurements over a wide frequency range. New features include the ability to measure and display any two parameters simultaneously to achieve coverage and flexibility not previously available. It runs up to six different tests in sequence with a single push of the start button. The unit provides fast and accurate sweep parameter measurements, for verification of component and material response to changes in ac test frequency, ac test voltage or ac test current without the need for complex programming or an external controller.
Test setups can be stored and recalled either from internal memory or from standard DOS formatted 3-1/2" floppy disks. The front panel controls can be locked out, with password protection, to ensure procedures are run the same way every time. Measured data can be stored on a floppy disk and then transferred to PC for data reduction and analysis.

Key Specifications and Characteristics

Test Frequency:	Range 10 Hz to 500 kHz, continuous
Resolution:	0.1 Hz from 10 Hz to 10 kHz, 5 digits> 10 kHz Accuracy: +/- 0.25%
Measurement Speed:	Basic: 40 meas/sec Enchanced: 8 meas/sec Extended: 1 meas/sec
Ranging:	Automatic, Range Hold or user selectable
Trigger:	Internal (automatic) External (via RS-232, IEEE 488.2 or Handler interfaces) Manual
AC Test Signal:	Voltage: 20 mV to 5.0 V (open circuit) up to 500 kHz 20 mV to 1.0 V (open circuit) 500 kHz - 2 MHz
Current:	250mV to 100mA

DC Bias Voltage:
Internal: 2.0V
External Range: 0 to +200V standard or +/- 500 V optional

Key Features:
- Fourteen measurement parameters
- Wide measurement ranges with six digits of resolution
- Fully programmable test frequency
- Menu driven interface for user friendly operation
- Measurement auto ranging or manual hold
- Programmable delay time from 0 to 1000 msec
- Measurement averaging fro9m 1 to 1000
- IEEE-488.2, RS-232, handler, and parallel printer interfaces, all standard

Analog/Digital Multimeter
27/AN

NSN: 9N6625-01-238-8248

Manufacturer:	Fluke
Contract No.:	N00104-99-D-X007
SCAT:	4212
Expiration Date:	3/17/04
Price:	$423

Product Features

The Fluke 27/AN Analog/Digital Multimeter combines accurate digital and analog measurement capability with extreme ruggedness and durability. It is totally sealed and tough enough to withstand water, contaminants, chemicals, accidental drops, and severe electrical overloads.The meter is MSHA approved and has met UL1244, CSA C22.2 No. 231, and VDE to IEC 348 testing.

FEATURES:
Auto and manual ranging
Touch-hold
Rugged, o-ring sealed case
Sealed battery/fuse doors
Min/Max relative mode
Audible continuity/diode test
EMI shielded
Battery Life: >1000 h (alkaline)

Key Specifications and Characteristics

DC VOLTAGE
Range: 320 mV to 1000 V
Accuracy: ±(0.1% + 1)
Resolution: 0.1 mV

AC VOLTAGE
Range: 320 mV to 1000 V
Accuracy: ±(0.5% + 3)
Resolution: 0.1 mV

DC CURRENT
Range: 320 µA to 10 A
Accuracy: ±(0.75% + 2)
Resolution: 0.1 µA

AC CURRENT
Range: 320 µA to 10 A
Accuracy: ±(1.5% + 2)
Resolution: 0.1 µA

RESISTANCE
Range: 320 Ω to 32 MΩ
Accuracy: ±(0.2% + 1)
Resolution: 0.1 Ω

CONDUCTANCE
Range: 32 nS
Accuracy: ±(2% + 10)
Resolution: 0.01 nS

DISPLAY
Digital: 3200 counts
Analog Bar Graph: 31 segments

Manufacturer:	Keithley
Contract No.:	N00104-97-D-X203
SCAT:	4212
Expiration Date:	5/7/02
Price:	$1,128

Digital Multimeter
175-AV/53A/58
NSN: 7Z6625-01-443-9922

Product Features

The Keithley Model 175A is a 4-1/2 digit LCD bench/portable Digital Multimeter with 0.03% basic DCV accuracy. It offers extended measurement capabilities including a 10A current range, 100 kHz bandwidth, and resistance measurements from 10 megaohms to 200 megaohms. Annunciators provide function, range, and feature indication. With the model 175A the user can choose either manual or auto-ranging. Fast auto-ranging is available on DC volts, ohms, AC volts, and dB. The Model 175A is suitable for audio and communications applications.

Key Specifications and Characteristics

DC VOLTS

RANGE	RESOLUTION	INPUT RESISTANCE	ACCURACY
200 mV	10 µV	>1 GΩ	0.03 + 2
2 V	100 µV	>1 GΩ	0.03 + 1
20 V	1 mV	11 MΩ	0.03 + 1
200 V	10 mV	10 MΩ	0.03 + 1
1000 V	100 mV	10 MΩ	0.03 + 1

TRMS AC VOLTS

RANGE	20Hz-50Hz	50Hz - 10kHz	10kHz-20kHz	20kHz-50kHz	50kHz-100kHz
2V-750V	1 + 20	0.5 + 20	1 + 40	2.5 + 75	5 + 200
200 mV	1+ 20	0.5 + 20	1.5 + 40	8 + 75	--

DC AMPS

RANGE	RESOLUTION	BURDEN	ACCURACY
200 µA	10 nA	0.3 V	0.15 + 2
2 mA	100 nA	0.3 V	0.15 + 2
20 mA	1 µA	0.3 V	0.15 + 2
200 mA	10 µA	0.3 V	0.2 + 2
2000 mA	100 µA	0.8 V	0.2 + 2
10 A	1 mA	0.3 V	0.5 + 2

TRMS AC AMPS

RANGE	BURDEN	20Hz - 50 Hz	50Hz - 10 kHz	10kHz - 30kHz
200uA-20mA	0.3V	1 +20	0.8 + 20	2 + 50
20 mA	0.3V	1 +20	0.8 + 20	--
2000 mA	0.8V	1 +20	0.8 + 20	--
10 A	0.3V	1.5 +20	1 + 20	--

Panel Meter Calibrator

1040C-03-05

NSN: 7Z6625-01-331-3049

Manufacturer:	Arbiter Systems
Contract No.:	N00104-98-D-X109
SCAT:	4926
Expiration Date:	6/15/03
Price:	$17,131

Product Features

The Arbiter Systems, Inc. Model 1040C Panel Meter Calibrator (PMC) is a compact, portable, and lightweight unit which provides eight calibration functions: voltage, current, frequency, power, power factor, phase, VARs and synchroscope. With all of these functions in one ruggedized instrument, the user can easily calibrate virtually every type of panel meter and many types of transducers, circuit breakers and overcurrent relays. A hand-held control is also provided to operate the Model 1040C at a distance when calibrating panel meters in a control room or substation.

Key Specifications and Characteristics

VOLTAGE

Output Range:	10 to 1000 Vdc 1.5 to 750 Vrms
Accuracy	±(0.2% setting + 0.05% FS)[1] (dc)
≤50 Vrms	±(0.2% setting + 0.05% FS)[1]
> 150 Vrms	±(0.2% setting + 0.1% FS)[1]
Burden	15 mA; 25 mA overload (dc)
≤150 Vrms	300 mArms
>150 Vrms	10 VA
Noise (dc)	≤0.25% setting; 10 kHz BW
Distortion	≤0.45%

CURRENT

Output Range:	0.1 mA to 10.5 Adc 0.1 to 7.5 Arms
Accuracy	±(0.2% setting + 0.05% FS)[2] (dc)
≤150 Arms	±(0.2% setting + 0.05% FS)[2]
> 150 Arms	±(0.2% setting + 0.1% FS)[2]
Compliance	6 Vrms: 6.5 V overload (ac)
≤50 Adc	12 Vdc; 12.5 V overload
>50 Adc	3 Vdc; 3.5 V overload
Noise (dc)	≤0.25% setting; 10 kHz BW
Distortion (ac)	≤0.45%

[1] Internal voltage ranges have full-scale (FS) values of 105 mV, 1.05 V, 10.5V, 105V, and 1000 V 9dc), and 15.75 Vrms, 157.5 Vrms, and 750 Vrms (ac).

[2] Internal current ranges have full-sale (FS) values of 1.05mA, 10.5 mA, 105 mA, 1.05 A, and 10.5 A (dc), and 1.05 Arms, and 7.5 Arms (ac).

FREQUENCY – AC OPERATION

Ranges:	50 to 75 Hz 333.3 to 500 Hz
Accuracy:	0.01%

GENERAL

Stability:	<(0.03% setting + 0.015% FS)[1,2] Averaged one minute or longer
Resolution:	<0.1% setting
Setting Time:	8 seconds max.

AC POWER

Range:	1.5 to 5625 VA
Current:	0.1 to 7.5 Arms
Voltage:	15 to 750 Vrms
PhaseAngle:	0E±0.33°
Stability:	<(0.6% setting + 0.03% FS) Averaged one minute or longer

Other ac power specifications are derived from the individual specifications for current and voltage.

PHASE, POWER FACTOR, VARS

PhaseAngle:	+180° to –180°
Accuracy:	±0.33°
Stability:	<0.2°rms, averaged on minute or longers
Resolution:	0.01°

Manufacturer:	Wayne Kerr, Inc.
Contract No.:	N00104-98-D-X116
SCAT:	4262
Expiration Date:	9/22/03
Price:	$6,479

Modulation Meter

AMM20002Q

NSN: 7Z6625-01-458-5920

Product Features

The AMM20002QC Automatic Modulation Meter from Wayne Kerr Electronics incorporates all the features needed to quickly characterize baseband and modulated carrier signals from transmitters and communications transceivers operating in the range 150kHz to 2.4 GHz. Specification and performance is intended for systems or bench use but the AMM20002QC is compact and lightweight and can be operated from external low voltage. AM, FM and PM (phase modulation) measurements to a basic accuracy of better than 1 % is achieved by using a built-in digital self-calibration source. The modulation bandwidth is a full 10 Hz to 300 kHz (down to DC for FM) allowing measurements on high data rate systems.

Key Specifications and Characteristics

RF INPUT

Frequency Range:	150 kHz to 2.4 GHz
Input impedance:	50Ω
Input VSWR:	<1.5:1 150 kHz to 1 GHz <3.0:1 1 GHz to 2.4 GHz
Tuning:	Automatic or Manual
Lock Time:	750ms
Sensitivity AUTO:	14 mV rms (-24 dBm), 250 kHz to <1 GHz 44 mV rms (-14 dBm), 1 GHz to <2 GHz 142 mV rms (-4 dBm), 2 GHz to 2.4 GHz
Sensitivity MANUAL:	7 mV rms (-30 dBm) <150 kHz to <1 GHz 22 mV rms (-20 dBm), 1 GHz to <2 GHz 71 mV rms (-10 dBm) <2 GHz to 2.4 GHz

AMPLITUDE MODULATION

Level:	0 to 99% (useable overrange to 105%)
Modulation rates:	10 Hz to 75 kHz for carriers 6 MHz to 2.4 GHz 10 Hz to 15 kHz for carriers 150 kHz to 6 MHz
Resolution:	0.3% of reading +0.01% AM Full four digits, with digital averaging
Accuracy:	±1% of reading ±0.01% AM
AM Distortion:	<0.3%, 1 kHz rate up to 80% depth

FREQUENCY MODULATION

Max Deviation:	±500 kHz peak, carriers 6 MHz to 2.4 GHz
Modulation Rates:	DC/10 Hz to 300 kHz, carriers 6 MHz to 2.4 GHz DC/10 Hz to 15 kHz, carriers 150 kHz to 6 MHz
Resolution:	0.3% or reading +1 Hz full four digits
Accuracy:	±1% of reading ±1 Hz at 1 kHz rate
FM distortion:	<0.1% for deviations up to 100 kHz and rates up to 15 kHz

LCR Meter

WK 7330

NSN: 7Z6625-01-408-4889

Manufacturer:	Wayne Kerr, Inc.
Contract No.:	N00104-99-D-X005
SCAT:	4457
Expiration Date:	3/8/04
Price:	$3,353

Product Features

The WK 7330 Automatic LCR Meter is a low-cost instrument that addresses the basic requirement for incoming inspection test of R, L, C, DF (dissipation factor), and Q (quality factor). Three test frequencies are standard and guarantee a basic accuracy of 0.1% over a wide range of LCR measurements. The WK 7330 features a binning capability that prompts the operator to direct the component into one of nine bins established by set bin limits. The bin settings are stored in nonvolatile memory and are saved when power is turned off.

Key Specifications and Characteristics

MEASUREMENTS

Function: L, C, R, D, Q; % or ABS deviation
Frequencies: 120 Hz, 1 kHz, 10 kHz ±0.01%
Level: 250 mV ±15 mV from 100 Ω source

GENERAL

Display: Five full digit LED display plus individual LED indicators
Connections: Four terminal built-in radial/axial fixtures
Auto Functions:
AutoRange
Series/Parallel
Auto Component
Trimming: Auto open and short-circuit compensation

ACCURACY

Resistance (Q < 0.1):
120 Hz (500 kΩ range): 0.1% ±1 mΩ
1/10 kHz (1 MΩ range): 0.1% ±1 mΩ
Resolution: 0.1 mΩ
Maximum Display: 999 MΩ
Capacitance (Q < 0.1):
120 Hz (1600 µF range): 0.1% ±2 pF
1 kHz (160 µF range): 0.1% ±0.1 pF
10 kHz (16 µF range): 0.1% ±0.01 pF
Resolution: 0.001 pF
Maximum Display: 990 mF

Inductance:
120 Hz (800 H range): 0.1% ±1 µH
1 kHz (160 H range): 0.1% ±0.1 µH
10 kHz (16 H range): 0.1% ±0.01 µH
Resolution: 0.001 nH
Maximum Display: 9900 H
DF (Dissipation Factor):
120 Hz (3.2 nF - 1.6 mF range): $\pm 0.001(1 + D^2)$
1 kHz (160 pF - 160 µF range): $\pm 0.001(1 + D^2)$
10 kHz (16 pF - 1.6 µF range): $\pm 0.001(1 + D^2)$
Resolution: 0.0001
Maximum Display: 9900
Q (Quality Factor):
120 Hz (800 H range): ±0.1(Q + 1/Q)%
1 kHz (160 H range): ±0.1(Q + 1/Q)%
10 kHz (1.6 H range): ±0.1(Q + 1/Q)%
Resolution: 0.0001
Maximum Display: 9900

Digital Multimeter

2001-M

NSN: 7Z6625-01-425-9735

Manufacturer:	Keithley
Contract No.:	N00104-99-D-X008
SCAT:	4209
Expiration Date:	4/22/04
Price:	$3,859

Product Features

The Keithley Model 2001-M Digital Multimeter in-circuit current measurement function offers a convenient accurate alternative to traditional current measurement techniques that's suitable for a wide array of applications.

Key Specifications and Characteristics

DC VOLTS

RANGE	RESOLUTION	INPUT RESISTANCE	ACCURACY(24Hrs)
200 mV	10 µV	>10 GΩ	10+6
2 V	100 µV	>10 GΩ	7+2
20 V	1 mV	>10 GΩ	7+4
200 V	10 mV	10 MΩ ± 1%	13+3
1000 V	100 mV	10 MΩ ± 1%	17+6

AC VOLTS ACCURACY

RANGE	20-50Hz	50 - 100Hz	0.1 - 2kHz	2-10kHz	10-30kHz
200 mV	0.25+0.015	0.07+0.015	0.03+0.015	0.03+0.015	0.035+0.015
2V	0.25+0.015	0.07+0.015	0.03+0.015	0.03+0.015	0.035+0.015
20V	0.25+0.015	0.07+0.015	0.04+0.015	0.06+0.015	0.08+0.015
200V	0.25+0.015	0.07+0.015	0.04+0.015	0.06+0.015	0.08+0.015
750V	0.25+0.015	0.1+0.015	0.08+0.015	0.09+0.015	0.12+0.015

RANGE	30-50kHz	50 - 100kHz	100 - 200kHz	0.2-1MHz	1-2MHz
200 mV	0.05+0.015	0.017+0.015	0.5+0.025	2+0.1	5+0.2
2V	0.05+0.015	0.017+0.015	0.5+0.025	2+0.1	5+0.2
20V	0.1+0.015	0.17+0.015	0.5+0.025	4+0.2	7+0.2
200V	0.1+0.015	0.17+0.015	0.5+0.025	4+0.2	
750V	0.15+0.015	0.5+0.015			

DC AMPS

RANGE	RESOLUTION	BURDEN	ACCURACY (24Hrs)
200 µA	10 pA	0.25 V	63 + 25
2 mA	100 pA	0.31 V	64 + 20
20 mA	1 nA	0.4 V	65 + 20
200 mA	10 nA	0.5 V	96 + 20
2A	100 nA	1.5 V	500 + 10

AC AMPS ACCURACY

RANGE	20-50Hz	50 - 200Hz	200Hz - 1kHz	1-10kHz
200 mA	0.35+0.015	0.2+0.015	0.4+0.015	0.5+0.015
2 A	0.3+0.015	0.15+0.015	0.12+0.015	0.12+0.015
20 mA	0.2+0.015	0.15+0.015	0.12+0.015	0.12+0.015
200 mA	0.3+0.015	0.15+0.015	0.12+0.015	0.15+0.015
2A	0.35+0.015	0.2+0.015	0.3+0.015	0.45+0.015

Digital Analyzing Voltmeter

2251-S3428

NSN: 7Z6625-01-414-0354

Manufacturer:	NAI, INC.
Contract No.:	N00104-00-D-X102
SCAT:	4204
Expiration Date:	3/30/05
Price:	$8,328

Product Features

NORTH ATLANTIC 2251-S3428
Digital Analyzing Voltmeter
Measures: total, fundamental, in-phase quadrature, phase angle transformation ratio
Wideband – 10 Hz to 100 kHz
Null meter

Key Specifications and Characteristics

RESOLUTION

Voltage Modes:	4-1/2 digits
Phase Angle:	0.01°
Frequency Display:	3 digits

SIGNAL SCALE RANGE

Voltage Modes:	20 mV - 300 V Full Scale in 6 ranges or autoranging
Phase Angle Mode:	0.00° - 360.00° or ±180.00°
Reference Range:	150 mV - 200 V, autoranging
Ratio Range:	0.01 to 2000 in 6 ranges with autoranging
Signal & Reference Autoranging:	Upranges at approximately 109% FS; down ranges at approx 10% FS.
Accuracy Phase:	±0.05* from 10 Hz to 50 kHz, ±1.0* from 50kHz to 100 kHz
Voltage:	± 2% of Full Scale in all modes, 2% of 300 from 0 to 300

DISPLAYS

Primary:	Sign plus 5-digit, 0.5 in. high, 7-segment red LED
Secondary:	
Lock Freq. (in kHz):	3 digit, 0.28 in. high, 7-segment red LED
Null Meter:	Zero center scale, moving LED, log scaled, 5/8 in. long. Covers dynamic range of scale selected with center having 1 LSB sensitivity.

GENERAL

Frequency Range:	10 Hz - 100 KHz
Input Impedance:	2 mΩ shunted by 200 pF (typical)
Nulling Sensitivity:	3 µV
Common Mode Rejection:	
30 to 999.9 Hz:	116 dB min.
1 to 5 kHz:	100 dB min
>5 to 32 kHz:	90 dB min
>32 to 54 kHz:	81 dB min
Harmonic Rejection:	45 dB all even and odd order
Data Refresh:	25 Hz and above 40 ms nominal l/f ms max below 25 Hz
Recorder Output:	±2.0 Vdc +.15% (SEL ±8.75 Vdc) in-phase and quad outputs

Manufacturer:	Agilent Technologies
Contract No.:	N00104-98-D-X102
SCAT:	4314
Expiration Date:	1/29/03
Price:	$8,130

500 MHz 4 Channel Oscilloscope

54825N

NSN: 7Z6625-01-451-8727

Product Features

The Agilent Technologies 54825A Infinium Oscilloscope combines a simple, analog-like front panel, graphical user interface, and a built-in information system to make high-performance measurements. A drag and drop feature is included that allows the user to measure waveforms using simple mouse driven operations. The built-in information system provides step-by-step instruction for 24 different measurements and procedures. In addition, a thorough index of help topics is available through a help menu. A high-resolution color display offers a waveform viewing area more than double that of many products in it's class.

Key Specifications and Characteristics

ACQUISITION

Max. Sample Rate, Real Time: 2 GSa/s on each channel

Max. Effective Sample Rate, Equivalent Time:	22 100 GSa/s
Memory Depth	32, 768 points/channel
Averaging:	Selectable from 2 to 4096

VERTICAL

Number of Channels:	4 (simultaneous acquisition)
Analog Bandwidth (-3 dB)	500 MHz
Rise Time:	700 ps
Sensitivity:	
1 MΩ	1 mV/div to 5 V/div
50 Ω	1 mV/div to 5 V/div
Input Impedance:	1 MΩ ± 1% (≈8 pF), or 50 Ω ± 1%
Input Coupling:	dc, ac (7 Hz, available in 1 MΩ only)
Max. Input Voltage:	
1 MΩ	±250 V (dc + ac) [ac <10 kHz), CAT I
50 Ω	5 V rms, CAT I
Channel-to-Channel Isolation:	dc to 50 MHz: 50 dB 50 MHz to 500 MHz: 40 dB

Offset Range:

Vertical Sensitivity	Available Offset
1 mV/div to 50 mV/div	±2 V
>50 mV to 250 mV/div	±10 V
>250 mV to 1.25 V/div	±50 V

Dynamic Range:	±12 div from center screen
DC Gain Accuracy:	±1.25% of full scale at full resolution channel scale
Resolution	
Real Time:	8 bits (0.4% of full scale), 12 bits with averaging

HORIZONTAL

Main Time Base Range:	500 ps/div to 20 s/div
Delayed Sweep Range:	1 ps/div to current main time base setting
Delayed Sweep Delay Range:	Within main time base acquisition record
Resolution:	10 ps
Time Base Accuracy:	50 ppm (0.005%)

TRIGGER

Internal:	dc to 100 MHz: 0.5 div 100 MHz to 500 MHz 1.0 div
External:	dc to 100 MHz 0.0225 × (signal range) 100 MHz to 500 MHz 0.045 × (signal range)
Sweep Modes:	Auto, Triggered, Single
Trigger Coupling:	dc, ac (7 Hz), low frequency reject (50 kHz), high-frequency reject (50 kHz)

TekScope Handheld Digital Oscilloscope

THS720A

NSN: 7Z6625-01-438-8024

Manufacturer:	Tektronix
Contract No.:	N00104-97-D-N007
SCAT:	4311
Expiration Date:	12/2/01
Price:	$1,976

Product Features

The THS720A TekScope™ Handheld Digital Oscilloscope combines a full-featured digital real-time oscilloscope with a digital multimeter in a rugged, battery-operated instrument. Scope and meter modes can operate simultaneously and independently on the same or separate signals. The high-resolution, backlit display, and pop-up menus make it easy for users to take full advantage of the instrument's many features. The THS720A offers Isolated-Channel™ architecture for safety.

Key Specifications and Characteristics

OSCILLOSCOPE

Channels:	2
Bandwidth:	100 MHz
Sample Rate:	500 MS/s each channel
Time/Division Range:	5 ns to 5 s/div
Sensitivity:	5 mV to 50 V/div (to 500 V/div with 10x probe)
Position Range:	±10 div
DC Gain Accuracy:	±2%
Vertical Resolution:	8 bits
Record Length:	2,500 points
Horizontal Accuracy:	±200 ppm
Roll Mode:	≥0.5 s/div
Trigger Modes:	Auto, Normal
Trigger Types:	Edge, pulse, video, ext
Video Trigger Formats and Field Rates:	Triggers on Field 1, Field 2, or lines
Waveform Processing:	Add, Subtract, Multiply, Calculate W = V × I
Waveform Storage:	10 waveforms
Acquisition Modes:	Sample, envelope, average, peak detect
Cursor Measurements:	ΔV, ΔTime, and 1/ΔTime
Cursor Types:	Horizontal bars, vertical bars, Paired (volts @ time)
Display System:	
Interpolation:	Sin(x)/x
Mode:	Vector, Dot, Vector Accumulate, Dot Accumulate
Format:	YT and XY

Automatic Measurements:
- Period
- + and - width
- + and - duty cycle
- High and low
- p-p
- Mean and cycle mean
- Burst width
- Frequency
- Rise and fall time
- + and - overshoot
- Maximum and minimum
- Amplitude
- rms and cycle rms

MULTIMETER

DC Voltage Ranges:	400 mV to 880 V
DC Volts Accuracy:	±(0.5% of reading + 5 counts)
True RMS AC Voltage Ranges:	400 mV to 640 V
Maximum Float Voltage:	600 V rms each channel
Resolution:	4,000 count, 3 1/2 digits
AC Volts Accuracy:	±(2% of reading + 5 counts)
Resistance Ranges:	400 Ω to 40 MΩ
Resistance Accuracy:	±(0.5% of reading + 2 counts)
Diode Test Range:	0 to 2 V
Continuity Check:	Audible tone when <50 Ω
Modes:	Min, Max, DMax-Min, avg, hold
Nonvolatile Storage:	10 DMM screenshots
Interface:	RS-232

100 MHz Oscilloscope

54645A-E01

NSN: 7Z6625-01-450-7534

Manufacturer:	Agilent Technologies
Contract No.:	N00104-98-D-X100
SCAT:	4308
Expiration Date:	12/5/02
Price:	$1,938

Product Features

The Agilent Technologies 54645A is a 100 MHz dual channel oscilloscope that features 2 ns/div sweep speed, 200 MSa/s acquisition and a high speed display. It is designed to measure a full range of signals from high speed digital operation to slow speed analog transducer inputs. Very deep memory and 50 second/div sweep allows the user to capture transducer and analog signals at higher sampling speeds and longer timebase settings. With MegaZoom® technology, the time/div and delay controls allow any part of the acquired waveform display to be expanded to the full extent of the memory available.

Key Specifications and Characteristics

VERTICAL SYSTEM, SCOPE CHANNELS 1 AND 2

Bandwidth (3 dB):	dc to 100 MHz @ ≥10 mv/div
ac coupled	1.5 Hz to 100 MHz
Rise Time (calculated):	~3.5 ns @ >10 mv/div, (<4.6 ns @ <10 mv/div)
Dynamic Imput Range:	±32 V or ±8 div whichever is less
Maximum Input:	400 V (dc + peak ac)
Range:	1 mV/div to 5 V/div
Accuracy:	±1.5% FS
BW Limit:	Approximately 20 MHz
Coupling:	ac, dc, GND
AC Coupled:	1.5 Hz to 100 MHz

HORIZONTAL SYSTEM

Sweep Speeds:	50 s/div to 2 ns/div main and delayed
Accuracy:	±0.01%
Horizontal Resolution:	40 ps

CURSOR ACCURACY

Single Channel:	Horizontal accuracy ±0.2% of screen width ±40 ps
Dual Channel:	Horizontal accuracy ±0.2% of screen width ±80 ps

TRIGGER SYSTEM

Source:	Channel1, Channel 2, line external
Slope:	Rising or falling
Modes:	Auto, Autolevel, and Normal
Sensitivity	
DC to 25 MHz:	> 10 mV/div ≤ 0.35 div or 3.5 mV
	< 10 mV/div ≤ 1 div or 2 mV
25 MHz to	> 10 mV/div ≤ 1 div or 10 mV
100 MHz:	> 10 mV/div ≤ 1.5 div or 3 mV

EXTERNAL TRIGGER

Range:	±18 V
Sensitivity:	dc to 100 MHz 100 mV
Coupling:	dc HF reject, and noise reject
Input resistance:	1 MΩ
Input Capacitance:	Approximately 13 pf
Maximum Input Voltage:	400V (dc + peak ac)
Sensitivty:	100 MHz to 100 mV

200 MHz HandHeld Oscilloscope

FLK-199/AN

NSN: 7Z6625-01-473-5174

Manufacturer:	Fluke
Contract No.:	N00104-00-D-X103
SCAT:	4307
Expiration Date:	5/10/05
Price:	$1,805

Product Features

For more demanding applications, the ScopeMeter 190 Series high-performance oscilloscopes offer specifications found on top-end bench instruments. With up to 200 MHz bandwidth, 2.5 GS/s real-time sampling and a deep memory of 27,500 point per input, they're ideal for engineers who need the full capabilities of a high-performance oscilloscope in a handheld, battery powered instrument.

Dual input - 60, 100 or 200 MHz bandwidth
Up to 2.5 GS/s real-time sampling per input
27,500 points per input record length using ScopeRecord™ mode
Automatic capture and replay of 100 screens
Four hours rechargeable NiMH battery pack
Includes a 5000 count true-RMS multimeter and a TrendPlot™ paperless recorder.

Key Specifications and Characteristics

General
Maximum resolution
5,000 counts
Voltmeter ranges
500mV, 5V, 50V, 500V, 1,000V
Accuracy
VDC: ± (0.5 % + 5 counts)
VAC true rms
15 Hz to 60 Hz: ± (1 % + 10 counts)
60 Hz to 1 kHz: ± (2.5 % + 15 counts)
VAC+DC true rms
DC to 60 Hz: ± (1 % + 10 counts)
60 Hz to 1 kHz: ± (2.5 % + 15 counts)
Ohms
Ranges: 500W, 5kW, 50kW, 500kW, 5MW, 30MW
Accuracy: ± (0.6 % + 5 counts)
Other meter functions
Diode test: Up to 2.8V
Amps: Amp DC, Amp AC, Amp AC+DC
0.1 mV/Amp to 100 V/Amp
Input impedance: 1 MW ± 1% // 10 pF ± 2 pF
Advanced meter functions: Auto/manual ranging, relative measurements (Zero reference), TrendPlot recording

Oscilloscope Calibrator
5820A-5C/AN
NSN: 7Z6625-01-477-8453

Manufacturer:	Fluke
Contract No.:	N00104-00-D-X107
SCAT:	4777
Expiration Date:	8/25/05
Price:	$23,550

Product Features

The powerful 5820A Oscilloscope Calibrator is a complete, yet flexible solution for oscilloscope calibration. It calibrates virtually all your digital and analog oscilloscopes quickly, easily and affordably. Even in its basic configuration, the 5820A provides tremendous versatility, allowing you to meet the manufacturer's calibration requirements for oscilloscopes up to 600MHz. With its high bandwidth option, the 5820A's performance can be extended still further, to oscilloscopes up to 2.1GHz. The 5820A's five-channel output option facilitates fast, hand-free automated calibrations. The 5820A is compact, portable and rugged. On the bench, its small footprint leaves you plenty of workspace. Outside the lab, it's easy to carry, without the need for extra accessories like pulse heads.For automated applications, the five-channel option allows you to calibrate up to four oscilloscope channels, with trigger, simultaneously without changing cables. This allows you to perform fast, hands-free automated calibrations with documented procedures and results while freeing the operator to complete other work * a dramatic productivity improvement. Plus, the external trigger allows you to work with tough-to-capture signals like fast edges simultaneously.

Key Specifications and Characteristics

DC Voltage
Range: 0 to ±6.6V (50W)
AC Voltage (Squarewave)
Range: ±1 mV to ±6.6V p-p (50W)
Range: ±1 mV to ±130V p-p (1 MW)
Fast Edge
Range: 4 mV to 2.5V p-p (50W)
£ 300 ps Rise Time
£ 150 ps Rise Time
Leveled Sinewave
Range: 50 kHz to 2.1 GHz (with option)

±1.5% Flatness
Time Markers
Range:
5s to 500 ps (with option)
Spike, square, 20% pulse, sine
Wave Generator
Ranges:
1.8 mV to 55V p-p (1 MW)
1.8 mV to 2.5V p-p (50W)
0.01 Hz to 100 kHz
Square, Sine, Triangle
Pulse Generator
Range: 15 mV to 1.5V amplitude

DC Voltage Measurement
Range: 0 to ± 10V
DC Current
Range: ±100 µA to ±100 mA
AC Current
Range:
100 µA p-p to 100 mA p-p
10 Hz to 100 kHz Squarewave
Input Impedance
Measurement
Range: 40W to 1.5 MW
Overload Measurement
5V to 9V (dc or ac squarewave), 5 to 60 seconds

General Specifications
Settling Time
5 seconds or faster for all functions and ranges
Standard Interfaces
IEEE-488 (GPIB), RS-232

Oscilloscope Calibrator

9500-S263
9500-S264

NSN: 7Z6625-01-477-8594
NSN: 7Z6625-01-477-8567

Manufacturer:	Fluke
Contract No.:	N00104-00-D-X107
SCAT:	TBD
Expiration Date:	8/25/05
Price:	$32,855/$54,618

Product Features

Key Specifications and Characteristics

Frequency Range: 10Hz to 1MHz
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
Frequency Accuracy: 10ppm
Trigger to Edge delay: 25ns (typical)
Timing Markers
Styles: Square/Sine, Pulse or Narrow Triangle
Square/Sine:
Period Square: 10ns to 50s
Period Sine:
9500/400 2.0ns to 10ns
9500/600 1.0ns to 10ns
9500/1100 0.5ns to 10ns
Pulse:
Period: 1µs to 50s
Rise/Fall Time: <700ps
Narrow Triangle:
Period: 1µs to 50s
Rise/Fall Time: 2.5% of period
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
Timing Accuracy:
Normal: ±10ppm
Timing Jitter: •10ps pk-pk
Deviation: ±45% for period
Amplitude: 100mV to 1V pk-pk
Leveled Sine and Dual Sine
Frequency Range:
9500/400 0.1 Hz to 400 MHz
9500/600 0.1 Hz to 600 MHz
9500/1100 0.1 Hz to 1.1 GHz
9500/3200 0.1 Hz to 3.2 GHz
High-Edge Pulse
Rise/Fall Time: 25ps return to ground
Mark/Space Ratio: 1:9
Amplitude:
Range: 1V to 200V pk-pk into 1M
1V to 5V pk-pk into 50
Accuracy: ±3%
Deviation: ±11.2%
Rise/Fall Time:
<100V <150ns
>=100V <200ns
Mark/Space Ratio: 1:1
Aberrations: <2% peak for first 500ns
<0.1% peak 500ns to 100µs
<0.01% peak beyond 100µs
Frequency: 10Hz to 100kHz
Accuracy: ±10ppm
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
Fast-Edge
Amplitude:
Range: 5mV to 3V pk-pk into 50
Accuracy: ±3%
Deviation: ±11.2%
Rise/Fall Time: 150ps return to ground
Mk/Sp Ratio: 1:9
Aberrations: <3% peak for first 1ns
<2% peak 1 ns to 10ns
<0.25% peak 10 ns to 50ns
Frequency:
Range: 10Hz to 2MHz
Accuracy: ±10ppm (±0.25ppm with Option 100)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5 or continuous
25pS Fast-Edge
Amplitude:
Range: 425 to 575mV pk-pk
Accuracy: ±2%

Pulse/CW Microwave Frequency Counter

5361B-915

NSN: 7Z6625-01-429-4636

Manufacturer:	Agilent Technologies
Contract No.:	N00104-96-D-N013
SCAT:	4294
Expiration Date:	6/14/01
Price:	$5,671

Product Features

The Agilent Technologies 5361B-915 Pulse/CW Microwave Frequency Counter offers both high-precision pulse and CW performance. With built-in frequency modulation profiling, the 5361B characterizes radar, EW, and communications systems or components. The counter makes complex measurements for the carrier frequency of agile signals, staggered PRIs, or the frequency transients in a pulsed or CW signal. It can be used to characterize radar pulses or test a Stable Local Oscillator (STALO). Functions for measuring step response, posttuning drift, and settling time facilitate accurate and easy testing of VCOs and DTOs

Key Specifications and Characteristics

FREQUENCY (INPUT 1)

Automatic Acquisition:	500 MHz to 20 GHz for CW and pulses >100 ns
Least Significant Dlgit:	1 MHz to 1 Hz for frequency, 0.001 Hz for PRF
Pulse Frequency Measurements	
Pulse Width (min):	Manual mode, 60 ns; auto mode, 100 ns
Pulse Rep Frequency:	Minimum 1 Hz, maximum 2 MHz
Measurement Time, Resolution, Accuracy:	See datasheet, Measurements
CW Frequency FM Tolerance:	55 MHz p-p
Tracking Speed (fast acquisition):	800 MHz/s
Acquisition Time:	Manual mode, <40 ms; automatic mode, fast acq., <100 ms
Gate Times (1 Hz resolution):	200 to 800 ms
Measurement Time:	Gate and acquisition time +100 ms
Accuracy:	See datasheet

PROFILE (INPUT 1)

Frequency Range (min/max for Y axis):	500 MHz/20 GHz
FM Chirp Tolerance (max span for Y axis):	10 MHz p-p
Time Range (min/max span for X axis):	100 ns/10 ms
Time Resolutlon:	1 ns
Internal Gate Width:	
Minimum:	11 ns to 23 ns; typical
Minimum:	14 ns
External Gate Width:	
Minimum:	Manual acquisition 20 ns; auto-acquisition 60 ns
Number of Data Points:	Up to 100
Profile Frequency Measurements	
Printers Supported:	HP 2225A, HP 2227B, HP 3630A Opt 002
Profile Phase Measurements:	See Application Note 377-4 for details. Computer required.

FREQUENCY (INPUT 2)

Range:	10 Hz to 525 MHz
Resolutlon/LSD:	1 Hz to 1 MHz
Time Base Aging:	$<1 \times 10^{-7}$ per month

Manufacturer:	Agilent Technologies
Contract No.:	N00104-99-D-X001
SCAT:	4296
Expiration Date:	11/12/03
Price:	$1,481

ELECTRONIC COUNTER

53131A-010-030-H14

NSN: 7Z6625-01-399-2298

Product Features

The Agilent Technologies Model 53131 Universal Counter has a frequency resolution of 10 digits per second and a complete set of test and analysis features. This multi function counter gives the user the option of measuring frequency, frequency ration, time interval, period, rise/fall time, positive/negative pulse width, duty cycle, phase, peak voltage, time interval average, and time interval delay. The unit provides up to 200 measurements per second at frequencies from DC to 225 MHz (channels 1 and 2) and up to 1.3 GHz in channel 3.

Key Specifications and Characteristics

CHANNEL 1 & 2 INPUTS

FREQUENCY RANGE

DC Coupled: 0.1 to 225 MHz
AC Coupled:
- 50 Ω: 1 MHz to 225 MHz
- 1 MΩ: 30 Hz to 225 MHz

VOLTAGE RANGE & SENSITIVITY

DC to 100 MHz: 20 mV rms to ±5 Vac+dc
100 to 200 MHz: 30 mV rms to ±5 Vac+dc
200 to 225 MHz: 40 mV rms to ±5 Vac+dc
Trigger: Rising or falling edge
Level Set: % of signal or absolute voltage
Gating and Arming: Auto; settable (defined by gate time or digits of resolution required); external; delay
Timebase:
- Temperature: $<2.5 \times 10^{-9}$
- Aging: 1.5×10^{-8} per month

MEASUREMENTS

Frequency:
- Channel 1 and 2 Range: 0.1 Hz to 225 MHz
- Channel 3 Range: 100 MHz to 1.3 GHz

Trigger: Defaults to 50% p-p signal
Period:
- Channel 1 and 2 Range: 4.4 ns to 10 s
- Channel 3 Range: 0.77 ns to 10 ns

Frequency Ratio:
- Results Range: 10^{-10} to 10^{11}
- Auto Gate Time: 100 ms

Peak Volts Channel 1 or 2
- Input Signal: >100 Hz and >100 mV p-p or dc
- Results Range: 100 mV p-p to ±5.1 V
- Resolution: 10 mV
- Accuracy: 20 mV + 10% of V peak

ADDITIONAL MEASUREMENTS

Time Interval 1 to 2: -1 ns to 10^{5} s
LSD: 500 ps
Pulse Measurements:
- Pulse Width CH1: 5 ns to 10^{5} s
- Rise/Fall Time CH1: 5 ns to 10^{5} s

Phase 1 to 2 Range: -180° to +360°
Duty Cycle 1 Range: 0 to 1
Totalize 1:
- Results Range: 0 to 10^{15}
- Resolution: ±1 count

Analysis: Limit testing, math (scaling and offset), statistics (min, max, mean, standard deviation)

Mini Optical Time Domain Reflectometer

MW9070NV

NSN: 7Z6625-01-388-4989

Manufacturer:	Anritsu
Contract No.:	N00104-98-D-X106
SCAT:	4318
Expiration Date:	5/21/03
Price:	$3,853

Product Features

The MW9070B is a high-performance mini OTDR for installation and maintenance of subscriber fiber optic lines and other fiber optic cables. It automatically detects the positions of faults in the cable, and displays an event table listing faults and a trace waveform. The MW9070B is designed with a wide dynamic range and short dead zone, and is indispensible for detecting faults in optical trunk lines, subscriber lines, optical CATV cables, optical LANs, and other types of fiber optic cables. In addition, it is also invaluable in measuring transmission line losses, connection losses, return loss and other parameters.

Key Specifications and Characteristics

MAIN FRAME

Display:	640 × 480 dot semitransparent LCD, 7 in. (with backlight on/off function)
Interface:	Serial: RS-232C, 1 port (D-sub 9P connector) Printer: 8 bit parallel (Centronics, D-sub 25P connector) Keyboard: For IBM
Waveform Storage:	Internal memory (battery backup)

AUTO MEASUREMENTS

Measurement Items:	Event distance, loss, return loss, loss from near end, and total return loss
Threshold:	Connection Loss: 0.01 to 9 dB (in 0.01 dB steps) Return Loss: 20 to 60 dB (in 1 dB steps) Fiber End: 1 to 10 dB (in 1 dB steps)
Number of Detection:	99 maximum
Automatic Setting Items:	Pulse width, distance range, averaging items

MANUAL MEASUREMENTS

Real-time sweeping, point-to-point distance/loss measurements, point-to-point loss measurements per unit length, return loss measurements, splice/connection loss measurements, and total return loss

Distance Unit:	m, km, ft, kft, miles
Relative Distance Measurement:	Zero cursor settable
IOR:	1.400000 to 1.699999 (in 0.000001 steps)
Title Input:	32 characters maximum
Power Supply:	Battery: MZ5018A battery pack DC Input: 10 to 18 V/14 W AC Input: 90 to 250 V, 50/60 Hz
Dimensions and Mass:	194 mm H × 290 mm W × 75 mm D, <3.2 kg

OPTICAL UNIT

Center Wavelength:	850 ± 30 nm (typical: ±15 nm)
Fiber:	62.5/125 µm multimode
Optical Connector:	ST
Distance Range (km):	5, 10, 25, 50, 100, 200
Pulse Width (ns):	20, 50, 100
Dynamic Range (S/N = 1):	18 dB
Measurement Range:	10 dB
Accuracy:	Distance measurements: ±2 m ± (10^{-4} × distance) Loss measurements (linearity): ±0.05 dB/dB or 0.1 dB Return loss measurements: ±4 dB
Measurement Time:	180 s maximum
Real-time Sweep:	1.0 s

Optical Time Domain Reflectometer

MTS 5200

NSN: 7Z6625-01-455-3364

Manufacturer:	Acterna
Contract No.:	N00104-98-D-X107
SCAT:	4310
Expiration Date:	4/29/03
Price:	$9,852

Product Features

The multimode (850/1300) MTS 5200 is the smallest Optical Time Domain Reflectometer (OTDR) in the world. It provides a full range of optical measurements including total loss, cumulative loss, section loss, reflectance, events, and optical-return loss. Information is displayed on an 8-inch VGA LCD screen and can be stored on an internal hard drive and/or 3.5 inch floppy drive. A built-in printer and IEEE interface is also included in the MTS 5200. Input power is 100-250 Vac or internally charged NiMH battery.

Key Specifications and Characteristics

TECHNICAL SPECIFICATIONS

Display:	Size: 8.4 in. Type: Color LCD Resolution: 640 × 480
Distance Units:	km, kft
Group Index Range:	1.30000 to 1.70000 in 0.00001 steps
No. of Data Points:	Up to 32,000 data points
Distance:	
Measurements:	Dual cursor
Cursor Resolution:	4 cm maximum
Accuracy:	±1 m
Attenuation:	
Measurements:	Dual cursor
Cursor Resolution:	0.01 dB
Accuracy:	±0.05 dB/dB
Reflectance Measurements	
Accuracy:	±4 dB
Storage:	
Internal Memory:	200 traces typical in internal memory
Floppy Disk Drive:	3.5 in., MS DOS compatible
Hard Disk:	1 GB
Input/Output:	RS232C, IEEE-488, Centronics, internal printer (option), external VGA (option)
Power Supply:	
AC/DC Adapter:	100 V to 250 V, 1.6 A, 50 Hz to 60 Hz ± 10%, 400 Hz ± 10%
Battery Type:	Internal removeable NiMH batteries
Weight:	6.5 kg (14.3 lb) including internal printer, 2 modules and 2 batteries
Size:	300 mm × 235 mm × 130 mm/ 12 in. × 9.25 in. × 5.1 in.
Humidity:	95% noncondensing

OTDR MODULES

	5021-NV	5022-NV
Central Wavelength:	850 ± 30 nm	1300 ±25 nm
Laser Safety:	Class 1	Class 1
Fiber:	62.5/125 µm	multimode
Pulsewidth:	3 ns to 100 ns	3 ns to 300 ns
Range:	Up to 40 km	Up to 80 km
RMS Dynamic Range:	24 dB	20 dB
Event Dead Zone:	1 m	1 m
Attenuation Dead Zone:	6 m	17 m

Fiber Optical Leak Detector

PX-D603

NSN: 7Z6030-01-414-8582

Manufacturer:	Photonix Technologies
Contract No.:	N00104-97-D-X208
SCAT:	4319
Expiration Date:	8/5/02
Price:	$902

Product Features

The flash detector series of optical leak detection sets is designed to locate energy leaks in fiber-optic systems due to splice loss, connector loss, breakage, or bending. By simply scanning over a fiber, the leak detection probe will beep whenever it encounters a light-loss point. Detecting signals as low as -65dBm, the probe is more sensitive than visible laser sources due to its use of IR energy rather than red light. The probe is powered by a 1/2 AA lithium cell and has a typical run time over 100 hours.

The stabilized light source is suitable for use as both a tracer signal generator (for leak detection) and a full-featured light reference (for use in loss testing applications). The sources are powered by AA alkaline batteries and ac wall pack as well as the included AA NICd cells. In addition, the source includes a built-in 1-hour quick charger for emergency situations.

Key Specifications and Characteristics

Detector:	Filtered Ge
Wavelength:	1300 nm ±30 nm
View Angle:	20°
Sensitivity:	-60 dBm minimum (-65 dBm typ)
Probe Mod:	500 Hz
Source Emitter:	LASER
Source Power:	-3 dBm minimum (adjustable to < –13 dBm)
Operating Temperature:	-5°C to 50°C
Storage Temp:	-10°C to 60°C
Hunidity:	10% to 90% noncondensing
Power:	US 120/240 Vac 60 Hz (included) NICd 4 AA 600 mAH (included) Alkaline 4 AA Probe 1/2 AA Lithium
Battery Life:	10 h source, 100 h probe
Trickle Charge:	12 h to 14 h (source only)
Quick Charge:	60 minutes (source only)

Fiber Optic Test Equipment

Optical Loss Test Set

OMK-10/N

NSN: 7Z6650-01-442-5441

Manufacturer:	Acterna
Contract No.:	N00104-97-D-X200
SCAT:	4954
Expiration Date:	4/2/02
Price:	$1,404

Product Features

The OMK-10/N Optical Loss Test Set (OLTS) is ideal for making power and loss measurements during installation, maintenance, and repair of fiber-optic networks. The test set provides audible fiber identification and has the capability of storing up to 150 measurement results. The units are housed in a rugged casing and include a universal interchangeable adapter system. The units calibration is traceable to national standards.

Key Specifications and Characteristics

OPTICAL POWER LEVEL METER

Wavelength Range:	800 nm to 1700 nm
Photodiode:	Germanium
Fiber Type:	9/125 µm to 100/140 µm
Standard Wavelengths:	820 nm, 850 nm,1300 nm, 1310 nm, and 1550 nm
Display Range:	-70 dBm to +11 dBm
Maximum Input Level:	+13 dBm
Intrinsic Error:	±0.13 dB (corresponds to ±3%)
Measurement uncertainty:	
For the Level Range:	-60 dBm to 0 dBm
850 nm:	±0.03 dB ±1.6 nW
1300 nm, 1310 nm:	±0.25 dB ±0.4 nW
1550 nm:	±0.70 dB ±0.4 nW
Display:	
Modulation Detection:	270, 300, 1000, 2000 Hz
Result Display:	LCD, 4 digit
Presentation:	dBm, dB, mW, µW
Resolution:	0.01 dB/0.001 µW
Auto Turn-off:	20 minutes
Operating Time:	
Dry Batteries:	36 h
Rechargeable Batteries:	12 h
Optical Connection:	ST

OPTICAL LED SOURCE

Type:	Infared LED
Wavelength Range:	1310 nm ±50 nm
Spectral Bandwidth:	150 nm typical
Output Power:	
50/125 µm Fiber:	-20 dBm
62.5/125 µm Fiber:	-15 dBm
85/125 µm Fiber:	-13 dBm
100/140 µm Fiber:	-11 dBm
9/125 µm Fiber:	-38 dBm
Output Accuracy:	±2 dB
Power Stability:	
Short Term (15 minutes):	±0.003 dB
Long Term (6 h):	±0.1 dB
Auto Turn-off:	20 minutes
Operating Time:	Same as meter
Optical Connection:	ST
Operating Temp. Range:	-10° to +55°C

Lan CableMeter
LT8155A

NSN: 7Z6625-01-449-3658

Manufacturer:	Acterna
Contract No.:	N00104-97-D-X212
SCAT:	4465
Expiration Date:	10/9/02
Price:	$2,346

Product Features

The LT8155A is designed to allow the user to certify and troubleshoot LAN installations. The autotest mode completes line map, dc loop resistance, length, capacitance, Dual NEXT™ power sum NEXT, ELFEXT, Power Sum ELFEXT, attenuation, Attenuation-to-Crosstalk Ratios (ACR), and return loss. The unit is user selectable for TIA or ISO autotest suites and automatically performs all required testing. The 155 MHz LT8155A stores up to 1500 autotests and can print or upload the test results for future use. Accuracy of the LT8155A meets TSB-67 Level IIE standards for basic and channel links.

Key Specifications and Characteristics

CABLE TYPES:
UTP/STP/FTP
CAT 3,5,5E; ISO Class C, D
Coax: 10BASE2,10BASE5
IBM STP Type 1,2,6

LINE MAP
8-wire pin connectivity, cable destination and shield continuity

DC RESISTANCE

Range:	0 to 400 Ω autoranging
Accuracy:	±(1% + 2 Ω)
Resolution:	0.1Ω

LENGTH

Range:	0 to 1100 ft (0 m to 335 m)
Accuracy:	±(3% + 3 ft +NVP uncertainty)
Resolution:	1 ft (0.3m)
Propagation Rate:	0.5-0.99c ±0.01

DELAY

Range:	0 to 4000 ns
Accuracy:	±(3% + 1 ns)
Resolution:	1 ns

AVERAGE IMPEDANCE (ZO)

Range:	35 to 180 Ω
Accuracy:	±(3% + 1 Ω)
Resolution:	0.1 Ω

CAPACITANCE

Range:	0 pF to 100 nF
Accuracy:	±(2% + 20pF)
Resolution:	1 pF minimum

ATTENUATION

Swept Frequency Range:	1 MHz to 155 MHz
Full Range:	70 dB
Frequency Steps:	150 kHz, 250kHz
Accuracy:	±0.6 dB at CAT 5/Class D
Resolution:	0.1 dB

NEAR END CROSSTALK

Swept Frequency Range:	1 MHz to 155 MHz
Full Range:	70 dB
Frequency Steps:	150 kHz, 250 kHz
Accuracy:	±1.6 dB at CAT 5/Class D
Resolution:	0.1 dB

RETURN LOSS

Swept Frequency Range:	1 MHz to 155 MHz
Frequency Steps:	150 kHz, 250 kHz
Range:	0 - 30 dB
Accuracy:	±2 dB at Class D
Resolution:	0.1 dB
Display:	160 × 160 backlight graphical LCD

Manufacturer:	Fluke
Contract No.:	N00104-96-D-N015
SCAT:	4567
Expiration Date:	7/2/01
Price:	$10,481

LANMeter
686/AN
NSN: 7Z6625-01-456-1561

Product Features

The Enterprise LANMeter Model 686/AN is a lightweight, portable meter designed for troubleshooting and analyzing network equipment and connections in 10 Mbps ethernet, 100 Mbps fast ethernet and 4/16 Mbps token-ring environments. SwitchWizard software provides the LANMeter with the capability to support switched networks. The LANMeter includes WideAreaWizard software and supports the SNMP protocol for enterprise network analysis. Multiple cable types can be easily tested, which include an autotest mode, against the selected test standards. The unit operates on removable/rechargeable NiCad batteries.

Key Specifications and Characteristics

PHYSICAL

Dimensions (H×W×D):	29.2 cm × 17.8 cm × 6.7 cm (11.5 in. × 7.0 in. × 2.65 in.)
Weight:	2 kg (4.5 lb)
Keyboard:	36-key Elastomeric with alphanumeric and dedicated keys
Display:	240 × 128 pixel bitmapped LCD. (H × W) 12 cm × 6.5 cm (4.75 in. × 2.5 in.)
Power:	Removable/Rechargeable NiCad
Communication Ports:	RS-232C serial port (DB-9)
Network Ports:	
Ethernet:	HUB connector (RJ-45) NIC connector (RJ-45) BNC (ThinLAN)
Token Ring:	MAU connector (RJ-45 and DB-9) NIC connector (RJ-45 and DB-9)

TDR SPECIFICATIONS

Resolution:	0.3 m (1 ft)
Minimum Distance:	0 m (0 ft) measures right up to connection point
Maximum Distance:	Dependent on cable type

MEASUREMENT ACCURACY

DC Resistance (BNC connector): ±10% (0 Ω to 200 Ω)

Cable Length:	0 m to 30 m (0 ft to 100 ft): ±(1% of reading +0.3 m (1 ft)) 30 m to 300 m (100 ft to 1,000 ft): ±2% of reading

SUPPORT NETWORKS

10 Mbps ethernet/100 fast ethernet (auto sensing)
4/16 Mbps token ring

CABLE TEST FUNCTIONS

Cable Types:	Unshielded twisted pair LAN cables of all categories (100 Ω UTP category 3, 4, and 5) Foil-screened twisted pair cables (100 ScTP, category 3, 4, and 5) Shielded twisted pair cables (150, IBM Type 1, 6, and 9) Coaxial cables: ThickLAN (10BASE5), ThinLAN (10BASE2), RG-58

INFORMATION STORAGE

Test results may be saved internally to the unit or uploaded to a PC.

Manufacturer:	Acterna
Contract No.:	N00104-98-D-X103
SCAT:	4160/4161
Expiration Date:	2/10/03
Price:	$9,064 $13,618

LAN Protocol Analyzers

Ethernet/Token Ring 9314/51

NSN: 7Z6625-01-428-9169

Ethernet/Token Ring/FDDI 9314/52

NSN: 7Z6625-01-428-9173

Product Features

The 9314/51 and 9314/52 configurations are easy-to-use, flexible, and portable LAN Protocol Analyzers for monitoring, troubleshooting, and simulation in LAN Ethernet/Token Ring and FDDI environments. The 9314/51 Ethernet/Token Ring unit is delivered with a lightweight soft pack. The 9314/52 is configured in a rugged, aluminum case and is delivered with a lightweight soft pack for accessories storage. The analyzers' functionalities can be expanded by adding any of the 9314/xx and 9316/xx models. Each configuration is delivered with Mentor software, the interactive expert analysis system. The Mentor system is a powerful, efficient, and easy-to-use diagnostic tool that quickly identifies and helps to solve network problems.

Key Specifications and Characteristics

9314/51

Ethernet and Token Ring network interfaces
Real-time analysis
Real-time hardware filtering
Decodes and displays all major protocols in ASCII, hexadecimal, or plain English
Remote operation via PC anywhere

9314/52

Ethernet, Token Ring, and FDDI network interfaces
Simultaneous dual port real-time analysis
Real-time hardware filtering
Decodes and displays all major protocols in ASCII, hexadecimal, or plain English
FDDI SAS and DAS connections
SAS connection for copper cabling (CDDI)
Optical bypass switch connection for operation in dual ring topology
Remote operation via PC anywhere

DATA RATES

Ethernet:	10 Mbps
Token Ring:	4 or 16 Mbps
FDDI:	100 Mbps

INTERFACE CONNECTORS

Ethernet:	AUI (DB-15), 10BaseT (RJ-45), 10Base2 (BNC)
Token Ring:	DB-9, UTP (RJ-45)
FDDI:	MIC-AS, MIC-B
CDDI:	RJ-45/S

ANALYZER HARDWARE

25 MHz, 32-bit word RISC architecture
24 MB capture memory

CONTROLLER

IBM compatible with 166-MHz Pentium, 16 MB of RAM, removable hard drive, 3.5 in. floppy drive, CD ROM, 33.6 kHz modem, PCMCIA slots, and active matrix display

POWER REQUIREMENTS

100 to 240 Vac with provided external adapter (selectable)

TRAINING AND SOFTWARE UPGRADES

Two training sessions annually, one in East Coast and one in West Coast. Includes systems software upgrades.

LAN/WAN Protocol Analyzers

LAN/WAN/Ethernet/Token Ring 9314/53

NSN: 7Z6625-01-428-9179

LAN/WAN/Ethernet/Token Ring/FDDI 9314/54

NSN: 7Z6625-01-428-9181

Manufacturer:	Acterna
Contract No.:	N00104-98-D-X103
SCAT:	4162/4163
Expiration Date:	2/10/03
Price:	$13,845 $18,238

Product Features

The 9314/53 and 9314/54 configurations are easy-to-use, flexible, and portable Internetworking Protocol Analyzers for monitoring, troubleshooting, and simulation in LAN (Ethernet, Token Ring, FDDI) and WAN environments. Each analyzer is configured in a rugged, aluminum case for safe and secure transport and is delivered with a lightweight soft pack for accessories storage. The analyzers' functionalities can be expanded by adding any of the 9314/xx and 9316/xx models. Each configuration is delivered with Mentor software, the interactive expert analysis system. The Mentor system is a powerful, efficient, and easy-to-use diagnostic tool that quickly identifies and helps to solve network problems.

Key Specifications and Characteristics

9314/53

Ethernet, Token Ring, and WAN interfaces
Simultaneous dual port real-time analysis across LAN/WAN
Real-time hardware filtering
Decodes and displays all major protocols in ASCII, hexadecimal or plain English
Decodes encapsulated LAN protocols
Remote operation via PC anywhere

9314/54

Ethernet, Token Ring, FDDI, and WAN interfaces
Simultaneous dual port real-time analysis across LAN/WAN
Real time hardware filtering
Decodes and displays all major protocols in ASCII, hexadecimal or plain English
Decodes encapsulated LAN protocols
FDDI SAS and DAS connections
SAS connection for copper cabling (CDDI)
Optical bypass switch connection for operation in dual ring topology
Remote operation via PC anywhere

DATA RATES

Ethernet:	10 Mbps
Token Ring:	4 or 16 Mbps
FDDI:	100 Mbps
WAN:	2,048 kbps full duplex

INTERFACE CONNECTORS

Ethernet:	AUI (DB-15), 10BaseT (RJ-45), 10Base2 (BNC)
Token Ring:	DB-9, UTP (RJ-45)
FDDI:	MIC-AS, MIC-B
CDDI:	RJ-45/S
WAN:	RS232/V.24, V.35, V.11, RS449, RS530, RS422, BANTAM

ANALYZER HARDWARE

25 MHz, 32-bit word RISC architecture
24 MB capture memory

CONTROLLER

IBM compatible with 166 MHz Pentium, 16 MB of RAM, removable hard drive, 3.5 in. floppy drive, CD ROM, 33.6 kHz modem, PCMCIA slots, and active matrix display

POWER REQUIREMENTS

100 to 240 Vac with provided external adapter (selectable)

TRAINING AND SOFTWARE UPGRADES

Two training sessions annually, one in East Coast and one in West Coast. Includes system software upgrades.

Network Test Instrumentation

ATM, Fast Ethernet, and LAN/WAN Protocol Analyzers

Manufacturer:	Acterna
Contract No.:	N00104-98-D-X103
SCAT:	See right column
Expiration Date:	2/10/03
Price:	See right column

ATM Chassis 9316/90.11
NSN: 7Z6625-01-428-9184 **Price:** $4,465

ATM DS-1 SCAT 4164AAA 9316/90.12
NSN: 7Z6625-01-428-9187 **Price:** $4,271

ATM DS-3 SCAT4164AAB 9316/90.13
NSN: 7Z6625-01-428-9176 **Price:** $4,355

ATM OC-3 Multimode
SCAT 4164AAC 9316/90.14
NSN: 7Z6625-01-428-9178 **Price:** $4,125

ATM OC-3 Single Mode
SCAT 4164AAD 9316/90.15
NSN: 7Z6625-01-453-5041 **Price:** $7,195

ATM 155 Mbps UTP 9316/90.16
SCAT 4164AAE
NSN: 7Z6625-01-453-5043 **Price:** $4,125

ATM E-1 SCAT 4164AAF 9305/90.73
NSN: 7Z6625-01-455-6714 **Price:** $6,357

Fast Ethernet SCAT 4165 9314/90.40
NSN: 7Z6625-01-455-0855 **Price:** $14,220

Ethernet/Token Ring 9314/02
SCAT 4160AAA
NSN: 7Z6625-01-455-0846 **Price:** $7,422

FDDI SCAT 4161AAA 9314/04
NSN: 7Z6625-01-455-0853 **Price:** $9,688

WAN SCAT 4162AAA 9314/01
NSN: 7Z6625-01-455-0849 **Price:** $7,422

MENTOR SOFTWARE 9314/93.33
NSN: **TBD** **Price:** $1,925

Product Features

The 9316/xx are easy-to-use, flexible, and portable Internetwork Protocol Analyzer modules for monitoring, troubleshooting, and simulation in ATM and Fast Ethernet environments. The ATM and Fast Ethernet modules can be added to any of the Internetwork Protocol Analyzers 9314/xx to expand test capabilities. The ATM chassis 9316/90.11 is required to support an ATM interface. The 9314/01, 9314/02, and 9314/04 are optional modules, which can be added to expand test capabilities of Internetwork Protocol Analyzers. Their specifications and characteristics were described in 9314/53, 9314/51, and 9314/52, respectively. Mentor is an interactive expert analysis system which is a powerful, efficient, and easy-to-use diagnostic tool that quickly identifies and helps to solve network problems.

Key Specifications and Characteristics

ATM

Full SVC emulation and statistics
Automatic ILMI ATM address registration
QoS measurements
Dynamic capture filters based on ATM addresses
Multiport synchronized analysis
Call set-up and Report Wizards

FAST Ethernet

Real-time analysis of 100Base-T and 10Base-T networks
Full line rate capture, analysis, and transmit on full and half duplex
Multiport synchronized analysis
Decodes all major LAN and WAN protocols

DATA RATES

DS-1:	1.5 Mbps
E-1:	2 Mbps
DS-3:	44.7 Mbps
OC-3 MM/SM:	155 Mbps
UTP:	155 Mbps
Fast Ethernet:	10 Mbps, 100 Mbps

INTERFACE CONNECTORS

DS-1:	BNC, RJ-45
DS-3:	BNC
E-1:	BNC
OC-3 MM:	SC
OC-3 SM:	ST
OC-3 UTP:	RJ-45
Fast Ethernet:	RJ-45, MII

TRAINING

Two training sessions annually, one in East Coast and one in West Coast

LAN/WAN Protocol Analyzers

LAN/WAN/Ethernet/Fast Ethernet/ATM OC-3 9314/12

NSN: 7Z6625-01-470-3150

Manufacturer:	Acterna
Contract No.:	N00104-99-D-X103
SCAT:	TBD
Expiration Date:	2/10/03
Price:	$29,937

Product Features

The 9314/12 configuration is a powerful, flexible, and portable Internetworking Protocol Analyzer for monitoring, troubleshooting, and simulation in Ethernet, Fast Ethernet, ATM, and WAN environments. The analyzer is configured in a rugged aluminum case for safe and secure transport in addition to a lightweight soft pack for accessories storage. The analyzer is delivered with Mentor software, the interactive expert analysis system. The mentor system is a powerful, efficient, and easy-to-use diagnostic tool that quickly identifies and helps to solves network problems.

Key Specifications and Characteristics

ETHERNET/FAST ETHERNET, and WAN

Auto detect Ethernet/Fast Ethernet
Simultaneous multiport real-time analysis across LAN/WAN
Real-time hardware filtering
Decodes and displays all major protocols in ASCII, hexadecimal, or plain English.
WAN: Decodes encapsulated LAN protocols

ATM

Full SVC emulation and statistics
Automatic ILMI ATM address registration
SoS measurements
Dynamic capture filters based on ATM addresses
Multiport synchronized analysis
Call set-up and report wizards

INTERFACE CONNECTORS

Ethernet/Fast Ethernet: RJ-45, MII
ATM: OC-3 MM, SC
WAN: RS232/V.24, V.35, V.11, RS449, RS530, RS422, Bantam

CONTROLLER

IBM compatible with internal and removable hard drives, 3.5 in. floppy drive, CD ROM, modem, PCMCIA slots, and active matrix display

POWER REQUIREMENTS

100 to 240 Vac with provided external adapter (selectable)

TRAINING AND SOFTWARE UPGRADES

Two training sessions annually, one in East coast and one in West coast.
Software upgrades are included.

Radio Test Set
2947

NSN: 7Z6625-01-432-6997

Manufacturer:	IFR
Contract No.:	N00104-96-D-N025
SCAT:	4345
Expiration Date:	6/24/01
Price:	$8,054

Product Features

The 2947 Radio Test Set communications service monitor was built to meet the requirements of the U.S. Navy and Federal Aviation Administration. It is the lightest, most rugged service monitor available with a full-performance spectrum analyzer.

The 2947 provides an excellent combination of instruments for all types of maintenance work, while providing exacting measurements for use in repair and calibration laboratories.

Key Specifications and Characteristics

FREQUENCY
Frequency Range: 400 kHz to 1.05 GHz
Resolution: 10 Hz or 1 Hz selectable

OUTPUT LEVEL
Output Level Range:
N-Type Socket: -141 dBm to -21 dBm
BNC Socket: -115 dBm to +5 dBm (overrange to +7 dBm)
Resolution: 0.1 dB

Accuracy +2 dB for level above -127 dBm on N-Type socket up to 1 GHz

SPECTRAL PURITY
Residual FM: Less than 12 Hz rms (0.3 kHz to 2.4 kHz)
Harmonics: Better than -25 dBc
Spurious Signals: Better than -50 dBc
SSB Phase Noise: Better than -108 dBc/Hz (20 kHz offset) up to 1 GHz

AMPLITUDE MODULATION - INTERNAL
Frequency Range: 400 kHz to 1.05 GHz
AM Depth Range: 0% to 99%
Accuracy: ±5% ±1 digit for modulation frequency of 1 kHz
Modulation Frequency: 20 Hz to 25 kHz

AMPLITUDE MODULATION - EXTERNAL
Input Impedance: Nominally 10 kΩ I 40 pF
Frequency Range: As internal AM
Modulation Freq: As internal AM
Sensitivity: 1 V rms for 100% AM

FREQUENCY MODULATION - INTERNAL
Frequency Range: 400 kHz to 1.05 GHz
Maximum Deviation: 75 kHz
Accuracy: ±7% at 1 kHz modulating frequency
Modulation Frequency: 20 Hz to 25 kHz
Range Pre-emphasis: 750 µs selectable

FREQUENCY MODULATION - EXTERNAL
Input Impedance: Nominally 10 kΩ I 40 pF
Frequency Range: As internal FM
Modulation Frequency: dc to 100 kHz
Pre-emphasis: 750 µs selectable
Sensitivity: 1 V rms for 0 kHz to 75 kHz deviation

MICROPHONE INPUT Press To Talk (PTT)
When using the microphone in Tx Test mode, the PTT will switch instrument to Rx Test allowing the 2947 to operate in Transceiver Talk through mode.

IEEE 488-2 (GPIB) programming interface

Manufacturer:	Wavetek
Contract No.:	N00104-98-D-X111
SCAT:	4358
Expiration Date:	6/26/03
Price:	$3,145

Synthesized Oscillator
98

NSN: 7Z6625-01-369-7692

Product Features

The Model 98, Synthesized Oscillator is a ruggedized, low distortion synthesized sine wave oscillator with up to
30 Vp-p output amplitude. Frequencies from 1 µHz to 1.1 MHz are generated using direct digital synthesis with eight-digit resolution 30 ppm accuracy. An external 10 MHz reference can be used to sychronize the output to an external frequency standard for improved accuracy. The Model 98 also has versatile frequency sweep capability, including continuous sweep, triggered sweep, sweep-and-hold, and sweep up/ down functions. The Model 98 combination of accuracte performance, user-friendly front panel, and standard GPIB interface make this the ideal product for precision bench-top and ATE application.

Key Specifications and Characteristics

FREQUENCY

Range: 1 µHz - 1.1 MHz
Resolution: 8 digits limited by 1 µHz
Accuracy: ±(30 ppm + 10 nHz)

Amplitude (50Ω Unbalanced Output)
Range: 15 mVp-p - 15 Vp-p (into 50Ω)
Resolution: 4 digits
Accuracy: 1% of setting ±1 mVp-p (at 1 kHz)
Flatness: (Relative to 1 kHz)
<100 kHz: ±0.3 dB
<1MHz: ±1.0 dB
<1.1 MHz: ±1.5 dB

Amplitude (600Ω Balanced Output)
Range: 30 mVp-p - 30 Vp-p (into 600Ω)
Resolution: 4 digits
Accuracy: 5% of setting ±5 mVp-p (at 1 kHz)
Flatness: (Relative to 1 kHz)
<100 kHz: ±1.0 dB
<200 kHz: +1, -4 dB

Sine Wave Purity
<20 kHz Harmonics <-65 dBc (typ. 0.02%)
<200 kHz: Harmonics <-55 dBc
<1.1 MHz: Harmonics <-46 dBc

SWEEP

Sweep Modes
Continuous sweep, continuous sweep with reverse, triggered sweep, triggered sweep with reverse, triggered
sweep and hold, triggered sweep and hold with reverse, manual sweep.

Start/Stop Frequency
Range: 1 Hz to 1.1 MHz in one range.
Resolution: 5 digits

Sweep Time
Range: 30 ms to 1000sec
Resolution: 1 ms
Accuracy: 0.1% ±1 ms

Test Set, Analog Signature

HUNTRON 5100DS/99-0315

NSN: 7Z6625-01-325-3672

Manufacturer:	Huntron Instruments
Contract No.:	N00104-98-D-X101
SCAT:	4554
Expiration Date:	12/29/02
Price:	$8,328

Product Features

The Huntron® Tracker® 5100DS can be used to quickly and easily troubleshoot boards with analog, digital, or mixed signal components. Technology as simple as diodes or as complex as surface mounted VLSI devices can be analyzed providing a flexible and economical approach to testing.

Data can be stored for future applications or shared with other Tracker equipped technicians making the unit extremely efficient. The powerful PC-based software that comes with the Tracker makes the job of "learning" and testing device signatures quick and easy. The menu driven software is simple to use and does not require programming. The wide variety of applications that the Tracker can be applied to makes this a valuable troubleshooting tool.

Key Specifications and Characteristics

SPECIFICATIONS

Test Frequency:	200 Hz
Line Voltage:	100 Vac, 110 Vac, 115 Vac or 230 Vac
Power:	32 W maximum
Display:	2.8 in. (7.0 cm) diagonal CRT
Test connectors:	64, 40, and 20 pin IDC connectors (for DIP clip cables), 40 pin ZIF socket (for individual component testing)
GPIB interface:	IEEE-488
Operating Temp:	+59°F to +86°F (+15°C to +30°C)
Storage Temp:	-50°C to +60°C (-58°F to +140°F)

RANGES

Ranges:

Range	V_S (Vpk)	Z_S (kΩ)	I_{sc} (mA rms)	P_{max} (mW)	P_{diode} (mW)
High	60	74	0.6	6	0.2
Medium 2	20	27	0.6	2	0.2
Medium 1	15	1.2	8.5	23	2
Low	10	54 Ω	132	232	33

Test Set, Semiconductor

2000B, 2000B-HSR410

NSN: 7Z6625-01-391-4404
NSN: 7Z6625-01-399-2299

Manufacturer:	Hunton Instruments
Contract No.:	N00104-97-D-X205
SCAT:	4553, 4553-ANC
Expiration Date:	6/18/02
Price:	$1,187 $1,794

Product Features

The Huntron®Tracker 2000B provides advanced troubleshooting capabilities to simplify testing newer technology components such as CMOS and MOS circuits. It's built-in pulse generator lets you thoroughly troubleshoot gate-fired devices such as SCRs, TRIACs, and optocouplers. By energizing the gate, you can test a component in an active mode. The 2000B allows the user to analyze the overall health of a solid-state component, which makes it perfect for finding leakage or substrate damage that has brought a system or PCB down prematurely. Because it can compare suspect components to known good equivalents, it is also ideal for troubleshooting when documentation is missing or incomplete.

Key Specifications and Characteristics

SPECIFICATIONS

Test Frequencies:	50/60 Hz, 200 Hz, 2000 Hz
Functions	
Range Selection:	Auto or Manual, High Range Lockout
Compare-A-Trace Adjustable:	(0.5 Hz to 10 Hz)
Pulse Generator:	
Level:	0-5 V
DC Mode:	+dc or -dc
Pulse Mode:	+Pulse, -Pulse, or both; adjustable duty cycle
Line Voltage:	100 Vac, 115 Vac or 230 Vac
Power:	20 Watts maximum
Display:	2.8 in. (7.0 cm) diagonal CRT
Dimensions:	11 in. L × 9 in. W × 4 in. H
Weight:	6.5 lb (3.0 kg)
Operating Temp:	+32°F to +122°F (0°C to +50°C)
Storage Temp:	-50°C to +60°C (-58°F to +140°F)

RANGES

Range	V_s (Vpk)	Z_s (KΩ)	I_{sc} (mArms)	P_{max} (mW)	P_{diode} (mW)
High	60	74	0.6	6	0.2
Medium 2	20	27	0.6	2	0.2
Medium 2					
Medium 1	15	1.2	8.5	23	2
Low	10	54 Ω	132	232	33

Test Set, Radio Frequency
4410A500

NSN: 7Z6625-01-443-9916

Manufacturer:	Bird Electronics
Contract No.:	N00104-97-D-X204
SCAT:	4958
Expiration Date:	5/15/02
Price:	$1,650

Product Features

The model 4410A500 is a Radio Frequency Test Set designed to make RF output power measurements, load-match measurements, power-to-load calculations, transmission-line loss measurements, and sample-transmission line power. The unit covers the 20 MHz to 1000 MHz range and can measure signals up to 1000 W.

Key Specifications and Characteristics

OPERATING SPECIFICATIONS

Coupler Frequency Range: 20 MHz to 1000 MHz
Continuous Wave Power
 Rating (nominal): 1000 Watts
Impedance (nominal): 50 Ω
 Insertion Voltage Standing-Wave Ratio:
 20 MHz to 512 MHz: 1.10:1 (ratio)
 512 MHz to 1000 MHz: 1.25:1 (ratio)
Insertion Loss:
 20 MHz to 512 MHz: 0.1 dB
 512 MHz to 1000 MHz: 0.2 dB
Connectors:
 Input/Output: Male Type-N
 Input/Output: Female Type-N
 Sample: Female Type-BNC

WEIGHTS AND DIMENSIONS

RF Test Set:
 Weight: 15 lb (6.8 kg)
 Length: 13-3/4 in. (349.3 mm)
 Width: 6 in. (171.5 mm)
 Height: 12-3/4 in. (323.9 mm)
Coupler:
 Weight: 10 oz (0.28 kg)
 Length: 2-7/8 in. (73 mm)
 Width: 1-1/4 in. (31.8 mm)
 Height: 2-51/64 in. (71 mm)
Wattmeter:
 Weight: 3 lb (1.4 kg)
 Length: 3-5/8 in. (92 mm)
 Width: 5-1/4 in. (133.4 mm)
 Height: 6-7/8 in. (174.6 mm)

ENVIRONMENTAL CONDITIONS

Ambient Operating
 Temperatures: 0°C to 50°C (32°F to 122°F)
Storage/Transport
 Temperatures: -40°C to +71°C (-40°F to +159°F)
Altitude (max): 15,000 ft
Relative Humidity
 (noncondensing): 0% to 95% RH ±5%

Decade Resistor
R3-1,110M

NSN: 7Z6625-01-334-0118

Manufacturer:	PPM, Inc.
Contract No.:	N00104-97-D-X211
SCAT:	4638
Expiration Date:	9/22/02
Price:	$1,053

Product Features

The PPM Model R3-1,110M decade resistor box is a precision selectable resistance standard suitable for use as a laboratory secondary standard.

The Model R3-1,110M contains three decades of selectable resistance: 1 MΩ per step, 10 MΩ per step, and 100 MΩ per step.

Key Specifications and Characteristics

The following frequency characteristics demostrate the accuracy of the PPM model R3-1,110M

Inductance is less than 0.8 μH (all decades set to zero). Capacitance is less than or equal to 15 pF per decade (any decade set to 10).

Accuracy:	±(0.1% of setting) at Vdc and 23 ± 1°C referenced to zero resistance setting.	
Maximum Voltage:	1 MΩ per step:	715 V
	10 MΩ per step:	1 kV
	100 MΩ per step:	1 kV
Maximum Voltage to Case:	1kVdc/peak ac, high or low terminal to case	
Current Per Decade:	1 MΩ per step:	0.715 mA
	10 MΩ per step:	0.1 mA
	100 MΩ per step:	0.01 mA
Zero Resistance:	Less than 0.003 Ω per decade	

Manufacturer:	PPM, INC.
Contract No.:	N00104-98-D-X112
SCAT:	4122
Expiration Date:	7/7/03
Price:	$2,856

Bridge Resistance

R1L-D

NSN: 7Z6625-01-456-9125

Product Features

The Model R1L-D Digital High Resolution Ohmmeter is a portable digital ohmmeter designed to measure low values of resistance. It utilizes the four-wire technique to eliminate errors caused by the resistance of the connections. Two leads are used to source and sink a regulated constant current through the resistance under test, and two separate leads are used to measure the voltage drop across this resistance. The R1L-D then calculates the value of the resistor under test and indicates the value on a LCD display. Three and two-wire measurement methods can also be selected.

In order to maintain accuracy, and automatic zero circuit turns off the rest current and resets the zero of the instrument prior to each resistance reading. This also serves to null out any thermally-generated voltages in the test leads or in the resistance being tested.

Key Specifications and Characteristics

RESISTANCE RANGES (PLUS AUTO-RANGE)

199.999 milliohms full scale
1.99999 ohms full scale
19.9999 ohms full scale
199.999 ohms full scale
1999.99 ohms full scale

TEST CURRENTS

199.999 milliohms full scale: 50 mA
1.99999 ohms full scale: 50 mA
19.9999 ohms full scale: 50 mA
199.999 ohms full scale: 0.5 mA
1999.99 ohms full scale: 0.5 mA

ACCURACY

+/-(0.05% of reading + one count)

ENVIRONMENT

Operating Temperature: 0 to 50°C
Storage Temperature: -40 to +71°C

Telecommunications Test Set

FB-6000-NAVY-P1
FB-6000-NAVY-P2
NSN: 7Z6625-01-462-7491
NSN: 7Z6625-01-462-7492

Manufacturer:	Acterna
Contract No.:	N00104-99-D-X006
SCAT:	4590
Expiration Date:	5/13/04
Price:	$12,458/$24,912

Product Features

The FIREBERD 6000 Communications Anlayzer is a multifunction test instrument capable of performing extensive bit error rate and service layer testing. Its modular design and available options allow testing of circuits and equipment operating at rates from 50 bps to 52 Mbs. The 6000 allows users to test ATM, frame relay, ISDN, low speed data, T1, 2M, T3, and 34M with the same instrument. The unit provides storage of up to 10 test programs at a touch of a button.

Highlights of the units are:
- Fast Packet testing
- ISDN Testing
- T-Carrier testing
- E-Carrier Testing
- DTE/DCE Datacom Testing

Provided in two configurations, the Fireberd 6000 is adaptable to multiple operating enviroments.

Key Specifications and Characteristics

Model FB6000 P1
Fireberd 6000A Communication Analyzer
Option 6001 DS1 Jitter Generator
Option 6003 DS1 Jitter Measurement
Option 6004 Clock Recovery
Option 6005 IEEE-488 Remote Control
41400 (RS-449/530/Mil) Interface
41440A (T1/FT1) Interface

Model FB6000 P2
Fireberd 6000A Communication Analyzer
Option 6001 DS1 Jitter Generator
Option 6003 DS1 Jitter Measurement
Option 6004 Clock Recovery
Option 6005 IEEE-488 Remote Control
41400 (RS-449/530/Mil) Interface
41440A (T1/FT1) Interface
41945 (T3) Interface
42242 (Diphase) Interface
43440 (DS1/DS3 ATM) Interface

Manufacturer:	Fluke
Contract No.:	N00104-96-D-N026
SCAT:	4933
Expiration Date:	6/26/01
Price:	$32,708

Multifunction Calibrator

5700A/AN-1

NSN: 7Z6625-01-433-0476

Product Features

The 5700A/AN-1 Multifunction Calibrator is designed to cover the widest portion of today's calibration workload—a wide variety of DMMs from all manufacturers. It delivers direct voltage to 1100 V and alternating voltage from 220 µV to 1100 V at frequencies from 10 Hz to 1.2 MHz. Cardinal point resistances range from 1 Ω to 100 MΩ in x1 and x1.9 decades, including a short circuit. Direct and alternating current are provided to 2.2 A, and frequencies for alternating current range from 10 Hz to 10 kHz. The 5700A is designed to be taken to the workload. In manufacturing applications, test instruments may be calibrated on-site using artifact Cal Stds, minimizing production line downtime due to calibration recall.

Key Specifications and Characteristics

DC VOLTAGE

Range:	0 V to 1100 V
Resolution:	10 nV to 100 µV
Stability:	
24 Hour:	(0.3 ppm + 0.3 µV) to (0.5 ppm + 200 µV)
Linearity:	(1 ppm + 0.2 µV) to (1 ppm + 200 µV)
Noise:	5 µV rms to 500 µV rms
Maximum Load:	50 mA
Load Regulation:	<0.2 ppm ± 0.2 µV, full load to no load
Line Regulation:	<0.1 ppm, ±10% selected nominal line
Overshoot:	<5%
Common Mode Rejection:	140 dB, dc to 400 Hz

AC VOLTAGE

Range:	0.22 mV to 1100 V
Resolution:	1 nV to 1 mV
Frequency:	10 Hz to 1 MHz
Display Format:	Voltage or dBm
Overshoot:	<10%

RESISTANCE

Range:	0 MΩ to 100 MΩ (0-1-1.9 sequence)
Stability:	2 ppm to 50 ppm

DC CURRENT

Range:	0 A to 2.2 A in 5 ranges
Resolution:	0.1 nA to 1 nA
24-h Stability:	(5 ppm +1 nA) to (9 ppm +7 µA)
Compliance Limit:	10 V typical
Maximum Load:	20 kΩ to 2 Ω

AC CURRENT

Range:	9 µA to 2.2 A
Frequency:	10 Hz to 10 kHz
24-h Stability:	typically <(100 ppm +20 nA)
Power Factor:	0.9 to 1
Frequency Uncertainty:	±0.01%
Frequency Resolution:	11.999 counts

GENERAL

Warm-up Time:	30 minutes maximum
Standard Interfaces:	IEEE-488, RS-232, 5725A, 5205A, 5220A, phase lock in (BNC), phase reference out

On-site calibration using artifact Cal Package

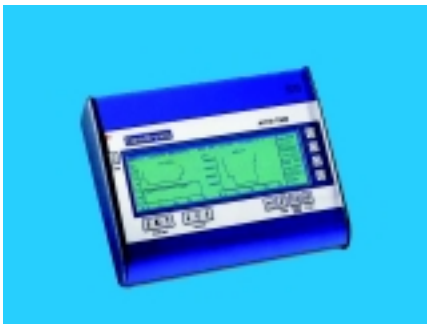
Telecommunications Test Set

AT3-NAV

NSN: 7Z6625-01-466-7151

Manufacturer:	Consultronics, Inc.
Contract No.:	N00104-99-D-X012
SCAT:	4570
Expiration Date:	8/23/04
Price:	$6,090

Product Features



The Automatic Transmission Impairment Measuring Set (Auto-TIMS III) is able to quickly perform a complete set of automatic analog measurements on 2 or 4 wire data circuits for cable, microwave, and satellite circuits. The unit provides an end-to-end and loopback testing capability with remote transponders. Testing can be conducted locally or from a remote location. Measurements are compared to industry standard pass/fail masks and are displayed in both numerical and graphical formats. The unit also provides Automatic DDS, ISDN and HDSI Local Loop qualification tests including attenuation, frequency response, noise, and high-speed impulse noise.

Key Specifications and Characteristics

Display:	480 x 128 Graphic LCD Display
Input / Output Connectors:	1000 VAC rms. to ground (1 minute)
Maximum DC Input:	200 VDC (Tx or Rx) or peak AC
Loop Holding:	Approximately 24 mA (Tx or Rx)
Impedance (Terminated):	Tx Impedances: low impedance, 135 W, 150 W, 600W, 900W, 1200W • Rx Impedances: 135W, 150 W, 600W, 900W, 1200W, bridging
Return Loss (Tx / Rx):	
Auto-TIMS Tx:	> 30 dB from 200 Hz to 20 kHz @ 600W
Auto-TIMS Rx:	> 40 dB from 200 Hz to 20 kHz @ 600W
Storage of Results:	16 complete sets of automatic test results can be stored
Remote Control:	RS232 serial interface with automatic modem initialization (AT command set)
Modem Types:	V.22, V.22bis, V.32, V.32bis, V.34, V34bis, and user customized type
Printer Interface:	Parallel & Serial
Internal Supply:	Gel Cell rechargeable battery
External Supply:	95 V to 250 V AC, 47 to 63 Hz, 0.6 A

Automatic Testing: Attenuation Distortion / Envelope Delay / Loss Deviation / Frequency Offset / Phase Jitter / Signal to Noise Ratio /
Noise / Noise to Ground /Non Linear Distortion (NLD) / Hits (Interruptions, Gain hits, Phase hits, Impulse noise)

Modes: 4 wire forward, reverse, bi-directional and loopback
2 wire leased or switched, forward, reverse and bi-directional.
4 wire (Central Office) / 2 wire leased forward, reverse and bi-directional
Testing 2 wire circuits automatically with TX-1 responders.
Testing 4 wire circuits automatically with TX-4 responders.
DDS, ISDN, HDSL cable qualification.

LEVEL & FREQUENCY MEASUREMENT

Transmitter:	
Frequency Range:	40 Hz to 400 kHz
Frequency Accuracy:	±0.01%
Resolution:	1 Hz
Step Size:	1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz
Frequency Measurement:	
Minimum Signal Level:	-40 dBm
Resolution:	1 Hz from 40 Hz to 400 kHz
Accuracy:	±1 Least Significant Digit
Reference Accuracy:	100 ppm

Cable Test Set
1502C-04

NSN: 7Z6625-01-376-8050

Manufacturer:	Tektronix
Contract No.:	N00104-99-D-X013
SCAT:	4298
Expiration Date:	8/17/04
Price:	$8,896

Product Features

The Model 1502C Metallic Time Domain Reflectometer is designed to quickly and easily locate opens, shorts, crimps, and other defects in metallic cables. The unit can measure cables up to 50,000 feet in length. The backlit LCD assures sharp images in any lighting. The menu driven operation allows users to quickly test cables and also includes help screens which saves valuable time. A waveform storage capability allows for comparison of real time and stored results. The unit has both AC and DC operation insuring portability

Key Specifications and Characteristics

ELECTRICAL

Test Signal:Vertical Scale:
0.05 mp/div to 500 mp/div.

Vertical Accuracy:
3% full scale.

Distance/Division:
0.1 Ft./div to 200 ft./div (0.025 m/div to 50 m/div).

Horizontal Accuracy:
1.6 inches (0.41 m) or + 1% or measured distance plus uncertainty in Vp, whichever is greater (for Vp = 0.66 and Dist/Div+ 1 ft.)

Step rise.

Amplitude:
300 mV nominal into 50 W load.

System Risetime:
10% to 90%, 200 ps (1.15 in./2.92 cm).

Output impedance:
50 W

Electrostatic Discharge Protection:
1 kV/500 pF/1 kW

Maximum Range:
0.05 in. (0.12 cm).

Distance Readout Resolution:
0.05 in. (0.12 cm).

Noise Filtering:
1 to 128 averages.

Vertical Scale:
0.05 mp/div to 500 mp/div.

Vertical Accuracy:
3% full scale.

Distance/Division:
0.1 Ft./div to 200 ft./div (0.025 m/div to 50 m/div).

Horizontal Accuracy:
1.6 inches (0.41 m) or + 1% or measured distance plus uncertainty in Vp, whichever is greater (for Vp = 0.66 and Dist/Div+ 1 ft.)

POCKET BERT Bit-Error Rate Test Set

72/62

NSN: 3H6625-01-380-3788

Manufacturer:	International Data Services
Contract No.:	N00104-00-D-X100
SCAT:	4589
Expiration Date:	8/05/04
Price:	$572

Product Features

The 72/62 POCKET BERT performs bit-error rate testing at synchronous data rates up to 72 Kbps and asynchronous data rates up to 38.4 Kbps at the RS-232-C interface. A dual LED, Line-Powered RS-232 Breakout Box is included. Also, optional interface converters allow testing to be performed at the V.35, X.21, RS-449, and EIA-530 interfaces.

The 72/62 POCKET BERT performs a bit-error rate test on synchronous and asynchronous modems, CSU/DSUs, and data networks. It counts the number of bit errors detected in the received data pattern, calculates the percentage of error-free seconds on received pseudo-random data, and counts the mark-to-space or space-to-mark transitions on any RS-232-C/CCITT V.24 interface line.

The breakout box monitors all 25 conductors of the RS-232-C/CCITT V.24 interface between the DTE and DCE. All signals may be interrupted to allow crosspatching. Three RS-232-C loads allow the user to load any line of the interface in order to stress-test the circuit and determine the margin of error before failure.

The mode of operation of the 72/62 POCKET BERT is determined by the front-panel switch settings. Changing any switch causes the 72/62 POCKET BERT to automatically reconfigure itself, reset its display and LED indicators, and resynchronize.

Key Specifications and Characteristics

INTERFACE	All transmitted and received signals are EIA RS-232-C/CCITT V.24 compatible
POWER	One 9 V rechargeable battery
BATTERY LIFE	2 h, retains charge for 12 months, charging time 14 h
CHARGER	Model 40 (115 VAC) or Model 41 (230 VAC) battery charger and wall-mounted power supply units are used to charge the battery or to operate the unit indefinitely from an ac voltage source
TEMPERATURE	Operating: 32° to 113°F (0° to 45°C) (while battery is being charged) 4° to +122°F (-20° to +50°C) (while battery is being discharged)
STORAGE	40° to +122°F (40° to +50°C). Enclosure high-impact plastic case
DIMENSIONS	13.5 cm H × 10.7 cm W × 4.8 cm D (5.3 in. × 4.2 in. × 1.9 in.) Weight 1 lb (454 g)
FRONT PANEL	Nonconductive LEXAN®

Manufacturer:	Fluke
Contract No.:	N00104-00-D-X105
SCAT:	TBD
Expiration Date:	7/21/05
Price:	$30,380

5520A/6

NSN: 7Z6625-01-476-3044

Product Features

Key Specifications and Characteristics

Product Index

Prices listed reflect the 2001 contract price.

Product Index